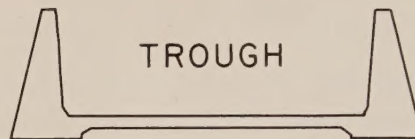


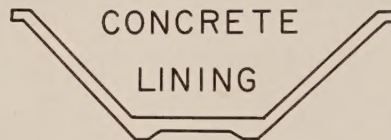
STRUCTURE CONDITION REPORT



STONE BARGE ENTERING LOCK 35 AT LOCKPORT



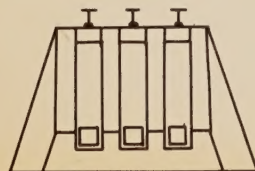
TROUGH



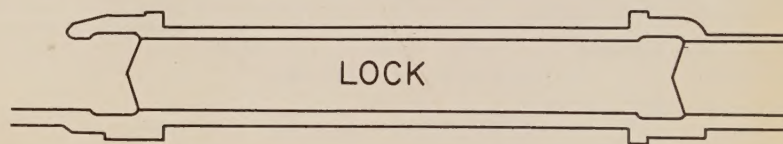
CONCRETE
LINING



BICENTENNIAL BARGE AT MEDINA



WASTE GATE

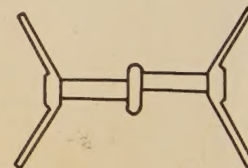


LOCK

BARGE CANAL FAIRPORT-LOCKPORT

MATERIALS BUREAU

NEW YORK STATE DEPARTMENT OF TRANSPORTATION



GUARD GATE

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
Raymond T. Schuler, Commissioner



1220 Washington Avenue, State Campus, Albany, New York 12232

February 28, 1977

Mr. George M. Briggs, Director
Transportation Maintenance Division
NYS Department of Transportation
1220 Washington Avenue
Albany, NY 12232

Dear Mr. Briggs:

Transmittal of Structure Condition Report
Barge Canal - Western Section - Fairport to Lockport
Region 4 PIN 4940.29-101
Region 5 PIN 5940.19-101

In accordance with your original request of December 16, 1974, this Bureau has evaluated the condition of the portland cement concrete in the structures and 38 of the 97 culverts located on the Barge Canal between Fairport and Lockport. This evaluation was conducted utilizing the following techniques:

Core samples were obtained and analyzed
from areas of each structure.

Compressive strengths were obtained
from selected cores.

Each structure was sounded to determine
both the presence of delaminated concrete and
to supplement the information obtained from
the cores.

The overall surface condition of the concrete
in each structure was visually inspected and
photographed.

Culverts were visually inspected and
photographed.

The conclusions and recommendations included in this report result from the summary of the information obtained from these evaluation techniques coupled with the intended function of each structural component.

Bureau personnel participating in this evaluation include: S. J. Candib, D. M. Sweredoski, C. G. Holub, J. J. DiFabio, D. Jarose and J. Pepe. J. J. Murphy and T. E. Wohlscheid coordinated the evaluation for the Bureau. Formal acknowledgment of the assistance and cooperation received from the following Region 4 personnel is herein noted: C. K. Burkwit, Regional Waterways Maintenance Engineer, and his entire staff, T. J. Mahaney, Technical Services Engineer and C. R. DiCenzo, Materials Engineer.

We would also like to extend our appreciation to typists Frances Spychalski, Beverly Gibbs, Ceil Leonard and Marge Elwood. Without their extra efforts and cooperation, this report could not have been timely prepared.

This report details the condition of the concrete in the structures for the subject canal area and should be used in conjunction with reports from other involved Bureaus and Subdivisions in evaluating the overall canal condition. If any questions arise concerning this report, please contact this Bureau. The structure condition report evaluating the nine structures between Fairport and Lock 33 was previously forwarded to you on August 1, 1975.

Historical data and additional information obtained on this section of the Canal was researched by Mr. Sam Candib. He would like to personally thank Mr. J. Stellato and his staff, Mr. C.K. Burkwit and his staff, Waterways Personnel at Pittsford and Lockport, and employees at the Syracuse Canal Museum and Rochester Public Library for their assistance in completing this portion of the investigation.

Very truly yours,

HARRY H. McLEAN
Director, Materials Bureau

By

Thomas E. Wohlscheid
THOMAS E. WOHLSCHEID P.E.

STRUCTURE CONDITION REPORT
BARGE CANAL - WESTERN SECTION
FAIRPORT TO LOCKPORT

REGION 4 P.I.N. 4940.29 - 101

REGION 5 P.I.N. 5940.19 - 101

MATERIALS BUREAU

ALBANY NEW YORK

FEBRUARY 1977

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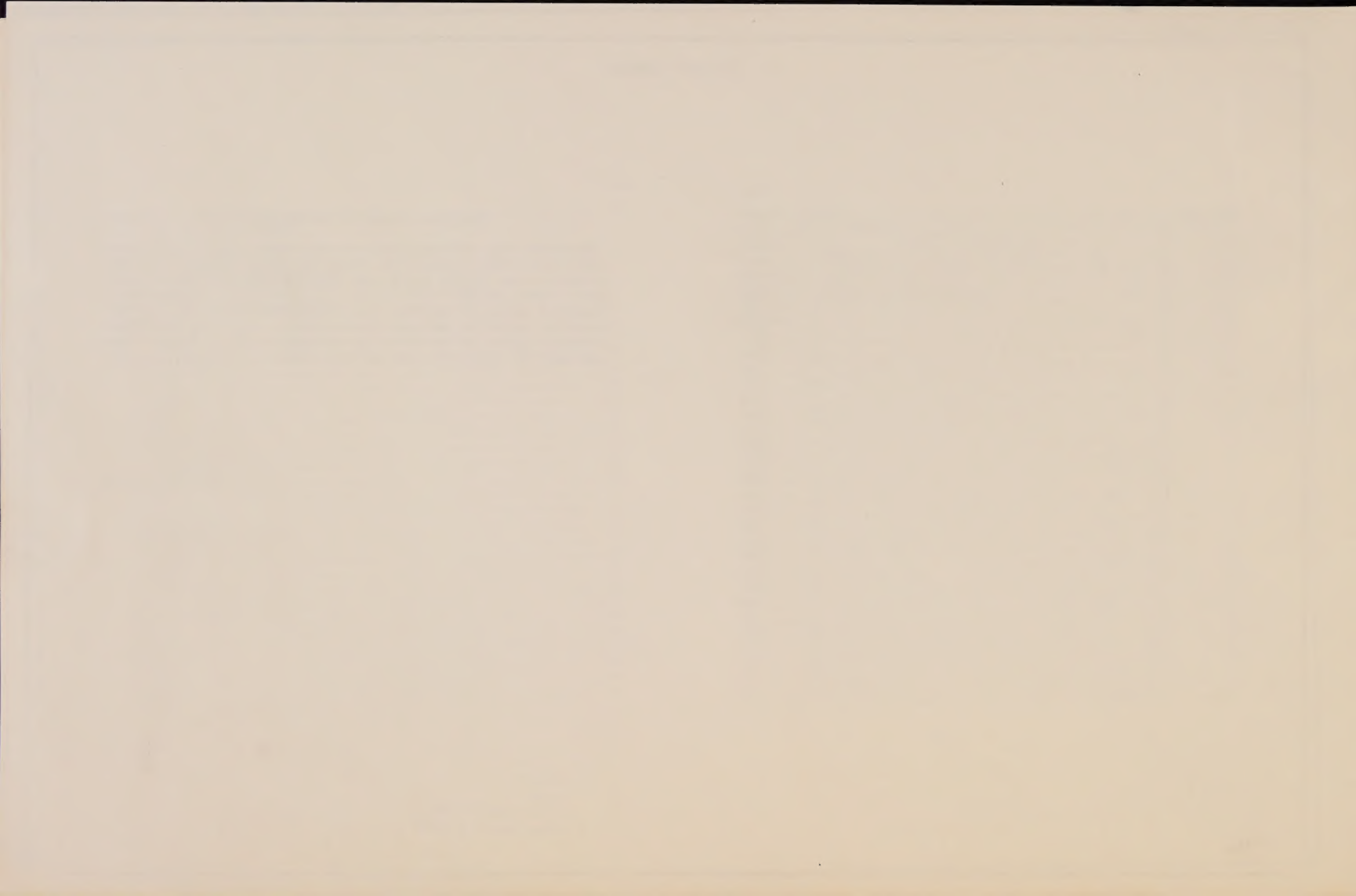
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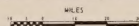


NEW YORK STATE DEPARTMENT OF TRANSPORTATION

BARGE CANAL SYSTEM & CONNECTING WATERWAYS

New York State Canals - Sesquicentennial
1825-1975

HUGH L. CAREY, Governor
RAYMOND T. SCHULER, Commissioner



LEGEND

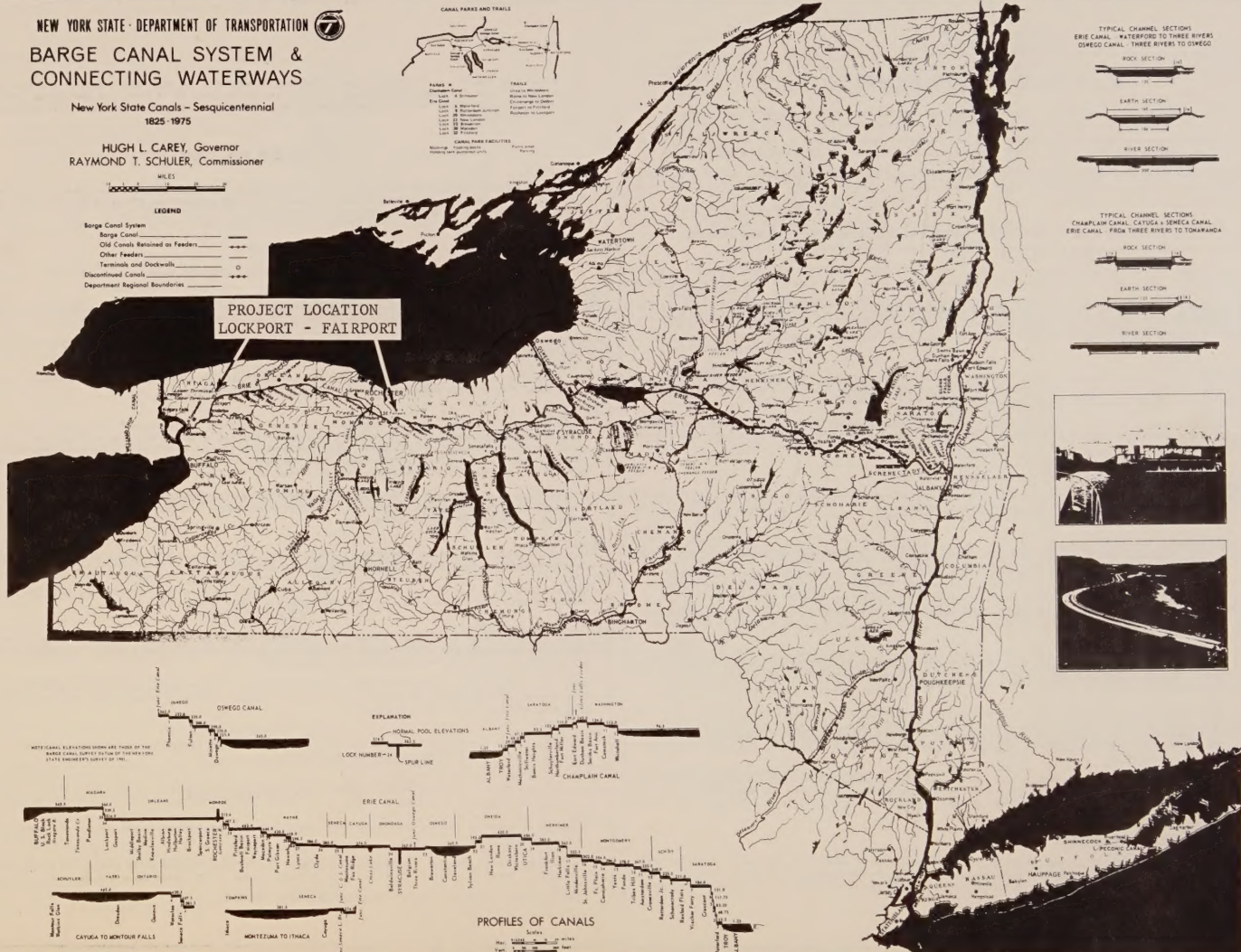
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- Terminals and Dockwalls
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- Department Regional Boundaries

PROJECT LOCATION
LOCKPORT - FAIRPORT



| TABLE II | |
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| Canal Park and Trail | |
| Lockport | Adirondack Park |
| Watkins Glen | Adirondack Park |
| Canajoharie | Adirondack Park |
| Canastota | Adirondack Park |
| Canastota | Adirondack Park |
| Canastota | Adirondack Park |
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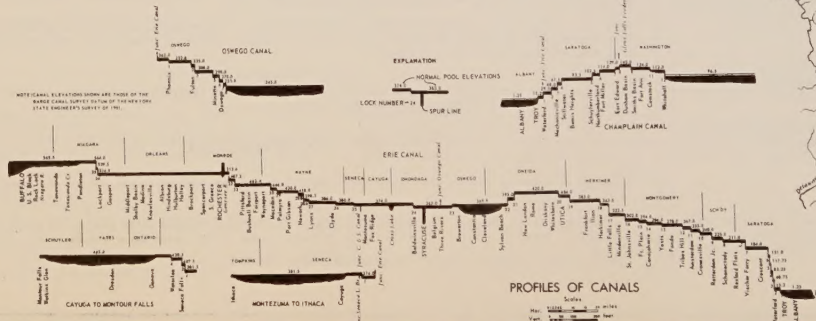
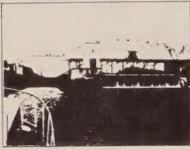
CANAL PARK FACILITIES
Boat launch, parking, picnic grounds, and other facilities.



TYPICAL CHANNEL SECTIONS
ERIE CANAL - WATERFORD TO THREE RIVERS
OSWEGO CANAL - THREE RIVERS TO OSWEGO



TYPICAL CHANNEL SECTIONS
CHAFFIN CANAL - CATUGA & SENECA CANAL
ERIE CANAL - FROM THREE RIVERS TO TONAWANDA



NEW YORK STATE BARGE CANAL SYSTEM FACT SHEETS

HISTORY

Early State Canals

The first canals constructed by New York State were the Erie and Champlain, begun on July 4, 1817 and opened by Governor DeWitt Clinton--sometimes called the father of New York State's public works concept--on October 26, 1825.

The original Erie Canal was completed at a cost of \$7 150 000. It extended from Albany westward to Buffalo, was 40 feet wide and 4 feet deep, and could accommodate boats of about 30 tons capacity, towed by horses or mules. It had 83 locks, each of which was 90 feet long and 15 feet wide.

The Champlain, of the same dimensions as the Erie, generally followed the route of the Champlain Division of the present Barge Canal System--through the Hudson River to Fort Edward, thence northward to Whitehall and Lake Champlain. The Oswego and the Cayuga and Seneca Canals were completed in 1828 and opened to navigation in 1829.

The first enlargement began in 1836 and was completed in 1862, providing a channel 70 feet wide and 7 feet deep to handle boats of 240 tons capacity. The cost of this enlargement plus subsequent improvements through 1895 totaled \$80 000 000.

The canals originally were toll facilities and as such contributed substantially to revenues of the State. Up to 1883, when it was voted to discontinue tolls, State canals had earned \$43 000 000 above costs of construction, enlargement, and operation. The canals have since remained toll-free.

1894 Constitutional Convention

As early as 1884 public opinion was developing for enlargement and improvement of existing canals in New York State, with the general public participating extensively in heated discussion, controversy, and agitation for both canal improvement and canal abandonment, as well as for a ship canal from the Hudson River to Lake Erie.

Influenced by the prevailing sentiment for canal improvement, the 1892 Legislature stipulated that one of the convention duties of delegates to the 1894 Constitutional Convention be "consideration of amendments relating to the care and improvement of the State Canals".

1902 Party Platforms

As a result of the action taken by the 1894 Constitutional Convention, both political parties at their convention in 1902 included a plank in their platform pledging the construction of a barge canal.

1903 Legislation and Election

The Barge Canal Referendum Bill was passed by the Senate and Assembly during the 1903 legislative session, and approved by the voters by a quarter-million vote majority in the November election.

Bond Issues and Toll-free Canal

In their vote to build the Barge Canal System, the people authorized a \$101 000 000 bond issue for its construction--the largest issue approved by a single state up to that time. They also reaffirmed the earlier decision that State canals remain toll-free.

Later bond issues in 1909, 1911, and 1913 brought the total of construction appropriations to \$154 800 000, including provision for improvement of the Cayuga and Seneca Canal to barge canal dimensions and construction of freight terminals. The canal bonded indebtedness is scheduled to be extinguished in 1971.

Barge Canal Construction

Construction of the new system, mostly on new location, began in 1905. River and lake channels were utilized wherever possible. The new canals were put into operation as sections were completed, and in 1918 the entire Barge Canal System was in service.

The new system included many engineering innovations, such as large-scale use of cement concrete, movable dams, and electric instead of manual operation of locks. With the increased dimensions of the new canals, the tug boat and the self-propelled barge became familiar sights, while the towpaths of the original Erie became relics of the past. The modern era of inland waterway transportation was under way.

GREAT LAKES - HUDSON RIVER WATERWAY IMPROVEMENT

In 1935, after economic studies by the U. S. Army Corps of Engineers indicated a benefit to cost ratio of better than 2 to 1, the Federal Government authorized a Federal aid improvement project for the 184-mile section of the Barge Canal System between Oswego on Lake Ontario and Waterford on the Hudson River, designated as the "Great Lakes-Hudson River Waterway Improvement".

Administered by the State and financed by the Federal Government, the improvement project provided for widening and deepening the channels, deepening through the locks and guard gates to 13 feet, and increasing overhead clearance under fixed bridges to 20 feet. After delays caused by World War II and the Korean conflict, the improvement project was completed in 1968.

THE BARGE CANAL SYSTEM

Mileage

The New York State Barge Canal System is 524 miles in length, of which 10 miles are sidelines to canal harbors at Utica, Syracuse, and Rochester. Canalized rivers, streams, and lakes account for 370 miles of the total, while the remaining 154 miles are artificial land-cut sections.

Canal Divisions

The Barge Canal System consists of four canals, or divisions:

- | | | | |
|--------------------|---------------|-----------------|----------------------------|
| 1. Champlain Canal | 2. Erie Canal | 3. Oswego Canal | 4. Cayuga and Seneca Canal |
|--------------------|---------------|-----------------|----------------------------|

Champlain Canal

The Champlain Canal extends from Waterford on the Hudson River to Whitehall at the southern tip of Lake Champlain. It utilizes the canalized Hudson River to Fort Edward, thence to Whitehall it is an artificial land-cut channel.

This canal is 60 miles long, consisting of 37 miles of river section and 23 miles of land-cut section. It has 11 locks (5 in the river section and 6 in the land-cut section), 1 guard gate, and 8 canal terminals.

The Federal Government marks and maintains a navigation channel in Lake Champlain from Whitehall north to Port Henry, Burlington, Plattsburgh, and Rouses Point.

Erie Canal

The Erie Canal stretches from Waterford westerly across the State to Tonawanda on the Niagara River. It uses the Mohawk River to Frankfort, continues as an artificial land-cut channel to New London west of Rome, and then uses Wood Creek, Ononda Lake, Ononda River, Seneca River, and Clyde River to Lyons. From Lyons to Lockport, the Erie Canal is an artificial land-cut channel, often located higher than the adjacent countryside, sometimes by as much as 60 feet. The last segment from Lockport to Tonawanda consists of a land-cut section and the canalized Tonawanda Creek.

This canal is 348 miles long, consisting of 220 miles of canalized rivers and lakes and 128 miles of land-cut channels. It has 35 locks (18 in river sections and 17 in land-cut sections), 2 guard locks, 10 movable dams, 2 taintor gate dams, 24 guard gates, and 42 canal terminals.

Oswego Canal

The Oswego Canal utilizes the Oswego River which flows northerly from Three Rivers Point, a junction on the Erie Canal west of Syracuse, to its outlet at Oswego on Lake Ontario.

This canal is 24 miles long and has 7 locks and 2 terminals. It also has 7 fixed dams, of which 5 have regulating taintor gates. All the dams have vertical head gates at power sluiceways.

Cayuga and Seneca Canal

The Cayuga and Seneca Canal extends from the junction of the Seneca and Clyde Rivers at May's Point on the Erie Canal to Ithaca on Cayuga Lake and Montour Falls, just south of Watkins Glen, on Seneca Lake. It utilizes the Seneca River and Cayuga and Seneca Lakes, the largest of the Finger Lakes.

This canal is 92 miles long, consisting of canalized river and lakes sections except for 2½ miles of land-cut section from Watkins Glen to Montour Falls and about ½ mile in Ithaca. It has 4 locks in the canalized Seneca River, 1 taintor gate dam, 4 guard gates, and 2 terminals.

Other Structures

Canal structures in addition to those already listed include such facilities as bypasses, spillways, syphons, culverts, approach walls, dykes, flumes, canal retaining walls, etc.

BARGE CANAL DIMENSIONS

Locks

There are 57 locks on the New York State Barge Canal System. The lock gates and valves are operated by electrically powered machinery.

The lock chamber is 328 feet long and 45 feet wide. The distance between sills permits an available length of 300 feet for floats. Depth of water over the sills is 12 feet, except on the Great Lakes - Hudson River Waterway where it is 13 feet.

Channels

The following channel dimensions prevail in the Barge Canal System:

| | Great Lakes- Hudson River Waterway | All Other Routes |
|------------------------------------|--|------------------------|
| Channel width in river sections | 200 feet | 200 feet |
| Channel width in rock sections | 120 feet | 94 feet |
| Surface width in land-cut sections | 160 feet | 123 feet |
| Bottom width in land-cut sections | 104 feet | 75 feet |
| Depth | 14 feet | 12 feet |

Bridges

Nearly 300 highway and railroad bridges span the canals. Their minimum vertical clearance above maximum navigable pool is 15½ feet, except on the Great Lakes - Hudson River Waterway where it is 20 feet. Their horizontal clearance is equivalent to the channel width.

FLOAT DIMENSIONSMaximum Size

The maximum size of a float that can pass through a lock is: length 300 feet; beam 43½ feet; height above water 15 feet. Economical draft will range from 9½ to 12 feet, dependent on the route being transited.

A coupled barge and tug meeting these dimensions can transport 2 600 tons, or approximately 800 000 gallons of gasoline. A self-propelled barge of 300 feet in length, called a "Jumbo" has a capacity of 3 600 tons, or about 1 100 000 gallons of gasoline.

OPERATION OF CANALSNavigation Season

The navigation season usually extends from mid-April through November.

Commercial Vessels

Commercial vessels are afforded passage through the system around the clock each day during the navigation season. Where traffic warrants, the locks and lift bridges are operated 24 hours a day. In other areas, arrangements can be made for passage during non-operating hours.

Pleasure Craft

Pleasure craft are passed through the system in accordance with a published pleasure boat operating schedule prepared to reflect seasonal pleasure boating patterns and favorable commercial traffic patterns.

MAINTENANCE OF CANALSFacilities

Canal structures, channels, and banks are maintained and repaired with land-based construction equipment and personnel, as well as with floating plant equipment (dredges, derrick boats, etc.) and personnel.

Canal channels are marked and outlined with buoy lights, stake lights and stake reflectors.

WATER SUPPLY AND SUMMIT LEVELSGeneral

The Barge Canal System is distinctively a river canalization facility. The natural flows in the canalized streams and numerous lakes supply the water needs of the canals to a large degree. However, in some locations it is necessary to augment these natural flows. This is accomplished by supplying water, usually from reservoirs, to the summit level of a canal--the highest navigation level on a canal. From the summit level, water is passed to the lower elevations on both sides.

Champlain Summit Level

The summit level of the Champlain Canal is located at Smith's Basin between Locks C-8 and C-9. It is supplied by the Glens Falls Feeder which takes water from the Hudson River west of Glens Falls.

Erie Summit Levels

The Erie Canal has two summit levels--the Rome level between Locks E-20 and E-21, and the Tonawanda level from the Niagara River at Tonawanda to Lock E-35 at Lockport.

The Rome summit level is supplied from two large canal reservoirs located north of Rome and Utica. These are the Delta and Hinckley Reservoirs, the former of which is supplied in turn by seven small Old Erie Canal reservoirs located in the Adirondack Mountains. In addition, nine small Old Erie Canal reservoirs situated south of Utica-Rome-Syracuse also supply this level.

The Tonawanda summit level is supplied by the Niagara River, carrying Lake Erie waters to supply the Erie Canal east to Rochester, and to augment the supply from Rochester to the Oswego River.

Oswego Summit Level

The Oswego Canal has no summit level. It is supplied with surplus navigation water from the Erie and Cayuga and Seneca Canals.

Cayuga and Seneca Summit Level

The summit level of the Cayuga and Seneca Canal is Seneca Lake.

SYSTEM UTILIZATIONSystem Tonnage

The five-year average of cargoes transported on the New York State Barge Canal System is approximately 2.8 million tons annually. The highest tonnage in the System's history was 5.2 million tons in 1951, while the lowest was 1.2 million tons in 1919. Petroleum, and products derived from petroleum, are the primary cargoes transported. Other items shipped include cement and lime, sugar, molasses, chemicals and forest products.

Traffic Pattern

The traffic pattern in the latest year:

| | |
|---|-------|
| Tonnage originating in the State for: | |
| Delivery in the State | 47.6% |
| Delivery out of the State | 23.4% |
| Tonnage originating out of the State for: | |
| Delivery in the State | 20.6% |
| Delivery out of the State | 8.3% |

Commercial Vessels

There are currently 51 tugs and 54 cargo carrying vessels operating on the Barge Canal System.

Pleasure Craft

Pleasure craft are not required to obtain permits to pass through the locks or under the movable bridges. New York State's registration law, however, requires that every mechanically propelled vessel, including sailboats that use auxiliary power, operated on the waters of the State must be registered and numbered. There are no size or horsepower limitations. U. S. Customs documented vessels are exempt. Registration responsibility rests with the Office of Parks and Recreation, Division of Marine and Recreational Vehicles, South Mall, Albany, New York, 12223.

Other Uses

Along with its principal role as a navigable waterway, the Barge Canal System serves as a water resource, supplying waters for domestic and sanitary purposes, industrial processing, irrigation of farm crops, generation of electric power, breeding grounds for fish and wildlife and variety of recreational activities.

As a recreational facility, the Barge Canal System offers a wide range of outdoor activities both on water and along its banks. Cruising, sailing, canoeing, fishing and swimming are popular pastimes on its waters, while along its banks, canal parks and trailways provide marine services and opportunities for picnicking, hiking and cycling.

WATERWAYS MAINTENANCE SUBDIVISION
MAY 1973

INTRODUCTION

This report was prepared at the request of George M. Briggs, Director of the Transportation Maintenance Division. The request initially resulted from a failure that occurred in the Bushnell Basin Trough on October 29, 1974, during construction of a sewer tunnel under the canal embankment. The tunneling operation was being performed by a contractor working on a project for the Irondequoit Bay Pure Waters District.

Mr. Brigg's request was translated into a work plan prepared by Lyndon H. Moore, Director of the Soil Mechanics Bureau and Project Coordinator for the Technical Services Subdivision. Mr. Moore's work plan included a "Purpose," a "Scope," and an "Investigation Schedule," defined as follows:

"PURPOSE - To develop long range monitoring and maintenance programs to provide continuous and efficient operation of the canal system and to insure public safety."

"SCOPE - To inspect and document the condition of the present canal system; to evaluate the condition and prepare recommendations for future corrective and preventive maintenance and monitoring programs."

"INVESTIGATION SCHEDULE -

Area 1 - Irondequoit Basin - Fairport to Lock 33 - 9 miles
 Area 2 - Wayne County Line to North Gates - 23 miles minus Area 1
 Area 3 - North Gates to Lockport - 40 miles."

Under the scope outlined, the Materials Bureau staff began a program to evaluate the condition of the concrete in the structures located in Area 1 between Fairport and Lock 33. The first portion of the evaluation was completed and submitted to the Transportation Maintenance Division on August 1, 1975.

Included in this report are the evaluations of the structures located in both Areas 2 and 3 and 38 of the 97 culverts located in all three areas. A complete listing of these structures are:

STRUCTURES INVESTIGATED

(East to West)

| <u>Guard Gates</u> | <u>Waste Gates and Weirs</u> | <u>Troughs</u> | <u>Locks</u> |
|--------------------|----------------------------------|--------------------|--------------|
| *Bushnell's Basin | Fairport | **Bushnell's Basin | *32 |
| *Cartersville | *Bushnell's Basin | **Irondequoit | *33 |
| Spencerport | *Cartersville | Holley | 34 |
| Brockport | Greece | Eagle Harbor | 35 |
| Holley | Spencerport | Medina | |
| Albion | Adams Basin | | |

*See Previous Report, Fairport-Lock 33, August, 1975.
 **See information in this report also.

STRUCTURES INVESTIGATED (Cont'd)

(East to West)

| <u>Guard Gates</u> | <u>Waste Gates and Weirs</u> | |
|--------------------|----------------------------------|------------------------|
| Medina | Brockport | |
| Middleport | Holley | |
| Gasport | Brockville | Brockville Quarry Wall |
| Pendleton | Albion | |
| | Eagle Harbor | |
| | Medina | |
| | Middleport | |
| | Watsons | |
| | Gasport | |
| | Lockport | |

CULVERTS

Number 26 through Number 125 - Only 38 of the 97 culverts have been inspected to date.

These structures were originally constructed between 1910 and 1918. Over the years, numerous repairs to the structures were completed by both Waterways Maintenance Personnel and by Contract. Each structure, whether previously repaired or the original concrete, was evaluated to determine its present condition.

The evaluation of the structure consisted of a thorough inspection of the overall concrete surface condition. A total of 66 representative core samples were taken from areas of the structure which were indicative of typical conditions.

The required core depth to reach sound concrete was determined during the coring operation through the visual examination of each extracted core. When the field crew believed that sound concrete was reached, the coring operation was terminated for that particular core. Each core was later inspected in detail in the laboratory. These inspections revealed that a few of the cores contained minute fracture planes at the depth previously determined to be sound concrete by the field crew. These minute fracture planes indicated that isolated delaminations still existed in the concrete structure at the lower depth of the core. Minute fracture planes in a core are an indication of the beginning of concrete deterioration. The required depth to reach sound concrete is necessary for the estimation of repair quantities as concrete for structural repair should be bonded to sound concrete in order to insure a permanent repair.

The cores submitted for compressive strength testing are representative of the sound concrete in the structure from which the core was obtained. Severely fractured or deteriorated portions of the core were removed prior to compressive strength testing. Some of

the tested cores did contain minute fracture planes, which did not appreciably affect the compressive strength results. Cores which contained minute fracture planes were so noted.

Soundings of each structure were used to both supplement the information obtained from the cores and to detect the presence of delaminations. Generally, soundings were only obtained along the lower 6 feet of the concrete or wherever one could walk. These soundings were interpreted, through visual observation and cores, into an overall condition of the concrete in any one area. Each structure evaluation contains a "Percent Delamination Listing" which was mainly developed from soundings.

The intended function of each structure on this section of the Canal was also investigated and related both to the safety of the public and to the operation of the Canal. Locks serve the purpose of permitting boats to travel the Canal system. The condition of the concrete in the four locks on this section of the Canal has little effect on the safety of the public but, of course, does affect the operation of the Canal. Guard gates can be lowered to prevent the flow of water should a breach in the Canal occur. The condition of the concrete in the guard gates, retaining walls, trough sections and waste gates has an effect on both public safety and the operation of the Canal.

A glossary of the technical terms as used in this report is included to assist the reader.

GENERAL CONCLUSIONS

The majority of the concrete in the structures located between Fairport and Lockport is in good condition.

The evaluation revealed that most of the concrete deterioration present on these structures is surface related. All surface related deterioration has no detrimental effect on the safety of the public or the operation of the Canal. However, this surface deterioration does effect the esthetics of the structure.

Portions of the guard gates, waste gates, troughs and Lock 35 contain isolated areas of deep deterioration. This deterioration is not extensive and does not effect the safety or operation of the structure at the present time. However, future repairs are required.

Deterioration in the Middleport Guard Gate, the Spencerport Guard Gate and Waste Gate, Holley Guard Gate and the Holley Trough have progressed to where repairs are recommended in the near future. The present condition of all the evaluated structures is included in the report sections describing each structure individually.

Of the 97 culverts located under this section of the canal, 38 have been inspected and included in this report. The majority of these culverts will require only minor repairs, yearly inspections and cleaning. Culvert #96 is the only culvert that has a road (Culvert Road) passing through it. This culvert has had a number of constant leaks throughout its history. Flow from these leaks increased in August, 1976 and a contract to correct all leaks will be completed in the Spring of 1977. Repairs in the near future will also be required at Culverts #57 (Brockport Creek); #77 (West Branch Sandy Creek); #103 (Jeddo Creek); and #107 (Jeddo Creek). Details of the 38 inspected present culvert conditions are included in the report. The remaining culverts will be inspected and reported separately.

This evaluation summarizes the present condition of the concrete in the structures after over 60 years of service and exposure to weathering. Portions of the evaluated stone block arch culverts date back to 1825. The recommendations and conclusions cover both immediate and future repair needs to insure continued efficient and safe operations. These recommendations and conclusions have resulted from the concrete condition evaluation and the intended function of each structure.

In order to retard future concrete deterioration and to improve appearance, it is desirable to completely restore each structure. However, compliance only with our recommendations will not satisfy this goal. Therefore, we recommend that a comprehensive, long range program be formulated to restore each structure. Structure restoration should be performed on a priority system considering first, the condition of the structure and its effect on public safety, and second, the effect of the structure on the operation of the canal system.

Concrete Compression Test Results

| <u>Structure Location</u> | <u>Core No.</u> | <u>Compressive Strength (pounds per square inch)</u> |
|---------------------------|-----------------|--|
| Adams Basin Waste Gate | 1 | 4030* |
| Adams Basin Waste Gate | 4 | 3640 |
| Albion Guard Gate | 1 | 3775* |
| Albion Waste Gate | 1 | 3515 |
| Albion Waste Gate | 2 | 7255 |
| Brockport Waste Gate | 1 | 4185 |
| Brockport Wier | 1 | 8870 |
| Eagle Harbor Trough | 1 | 2705* |
| Eagle Harbor Trough | 2 | 5300* |
| Eagle Harbor Waste Gate | 1 | 5790 |
| Eagle Harbor Waste Gate | 3 | 9175 |
| Gasport Guard Gate | 1 | 6125* |
| Gasport Weir | 1 | 4485 |
| Holley Guard Gate | 2 | 4895* |
| Holley Trough | 1 | 1680* |
| Holley Trough | 4 | 6265 |
| Holley Waste Gate | 4 | 4040* |
| Holley Waste Gate | 6 | 3600* |
| Lockport Waste Gate | 1 | 6250 |
| Lockport Waste Gate | 3 | 3030 |
| Lock 35 | 3 | 5915 |
| Spencerport Guard Gate | 2 | 2485* |
| Spencerport Waste Gate | 2 | 3225* |
| Spencerport Waste Gate | 3 | 5470* |
| Spencerport Weir | 5 | 6265* |
| Watson Waste Gate | 1 | 5815 |

*prefractured

ABUTMENT - a concrete wall which acts as a retaining wall and supports the end of an overhead structure.

AGGREGATE - sand and stone of various sizes used with water and cement to form concrete.

BUFFER BEAM - a steel beam that can be swung out from the upper and lower guide walls. Its purpose was to prevent barges from accidentally ramming the closed lock gates. They are no longer used.

BUTTRESS - a smaller vertical wall generally projecting at a right angle from another larger wall, to help prevent the larger wall from overturning.

COLD JOINT - an unintentional joint in concrete caused when a fresh layer of plastic concrete is placed upon a layer of concrete which has partially or completely set (hardened).

COMPRESSIVE STRENGTH - a term used to indicate the strength of concrete, designated as pounds per square inch (p.s.i.). It is calculated by dividing the applied load at fracture by the cross sectional area.

CONSTRUCTION JOINT - an intentional joint in concrete caused when a fresh layer of plastic concrete is abutted to a layer of hardened concrete. The function of a construction joint is to allow differential movement without damaging structural integrity.

CORE - a cylindrical sample of concrete (usually 4 inches in diameter) obtained by drilling with a thin walled tube.

DELAMINATION - cracking or fracturing of concrete under and in a direction parallel to its surface.

DETERIORATION - a condition of portland cement concrete which implies distress in the form of scaling, delamination, cracking, or efflorescence.

EFFLORESCENCE - a whitish, crystalline deposit on the surface of concrete caused by the evaporation of mineral bearing water as it exits from cracks in concrete.

EMBANKMENT - a bank of earth used to confine the canal above the level of the natural landscape.

FOOTING - a concrete substructure located at the bottom of a wall, pier, or column which distributes the weight and load downward into the underlying soil.

FRACTURE PLANE - an area of weakness in a concrete structure which may be evidenced either by a hollow, dull sound when the concrete is struck with a hammer, or by a crack in a core sample.

FREEZE-THAW CYCLE - cycles of alternate freezing and thawing resulting from weather conditions. It is usually associated with distress in the concrete caused by the expansive forces of freezing water.

GRAVITY WALL - a concrete retaining wall designed to be stable by virtue of its shape and weight.

GUIDE WALL - the walls at the upper and lower ends of the lock where boats are guided into the lock chamber.

INTENTIONAL BREAK - damage done to a core while removing it from the core hole during the coring operation. The core barrels are only capable of drilling a 12 inch long section at one time. After this first section is broken off and removed, the next 12 inch section can be drilled.

MEMBRANE WALL - that part of the waste gate which acts as a thin walled dam.

PIER - a concrete support used to hold up the center sections of a bridge or gate between the abutments.

PILE - wooden shafts driven into the earth to carry or transfer structure loads to the soil or to underlying rock.

RETAINING WALL - a structure designed to hold back a mass of earth.

SCALING - progressive disintegration of concrete surfaces resulting from expansive pressures generated by freezing of water.

SHEET PILE - wooden planks or steel sheets driven into the earth and used to control the underground flow of water and fine grained soils. Also referred to as sheeting.

SHOTCRETE - mortar or concrete conveyed through a hose and pneumatically projected at high velocity onto a surface. Shotcrete has been used for the repair of deteriorated surfaces in the canal.

SILL - a concrete slab which supports the bottom of a guard or lock gate.

SODA STRAW - a thin walled, hollow deposit of calcium carbonate and other minerals, hanging vertically from a concrete surface, that has the appearance of a soda straw.

SOUND CONCRETE - concrete which has acceptable compressive strength, durability and quality. Sound concrete does not contain fracture planes, delaminations or other forms of deterioration.

SOUNDING - a method used to determine delaminated concrete by striking the surface with a hammer. Delaminated concrete has a dull or hollow sound while good concrete has a clear ringing sound.

SPLAY WALL - an extension of the ends of an abutment or retaining wall that angles into the embankment to hold the earth in place. Also called wingwall.

STOP LOG COLUMN - slotted columns in front of the waste gate. In the event that an open sluice gate malfunctions, short sections of wood planks can be placed into the slots to stop the flow of water.

SUBSTRUCTURE - the concrete foundation (piers, columns, abutments, etc.) which supports the remainder of the structure.

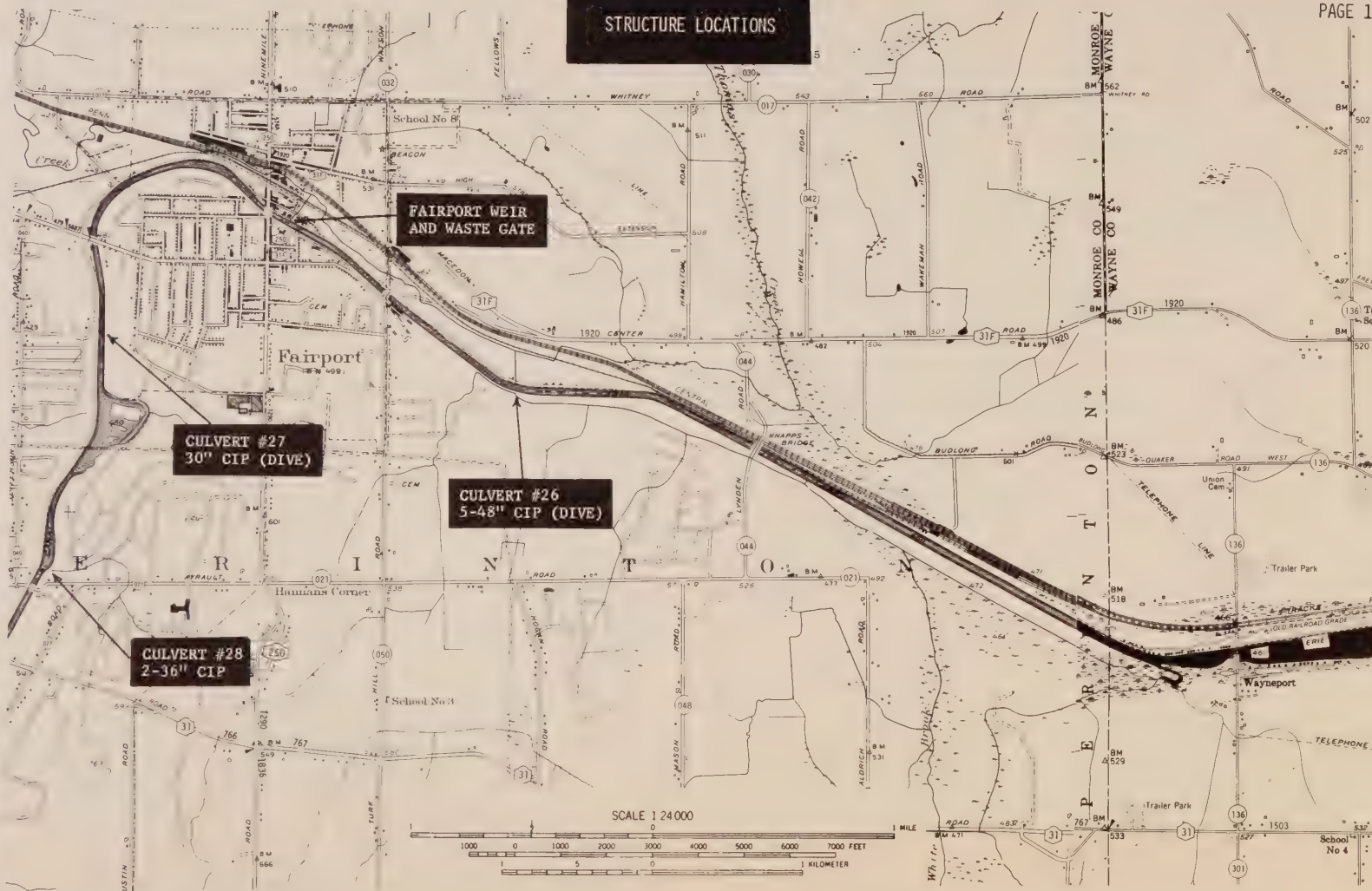
SURFACE DETERIORATION - deterioration that exists from 1 to 3 inches in depth into the structure, normally in the form of scaling or delamination.

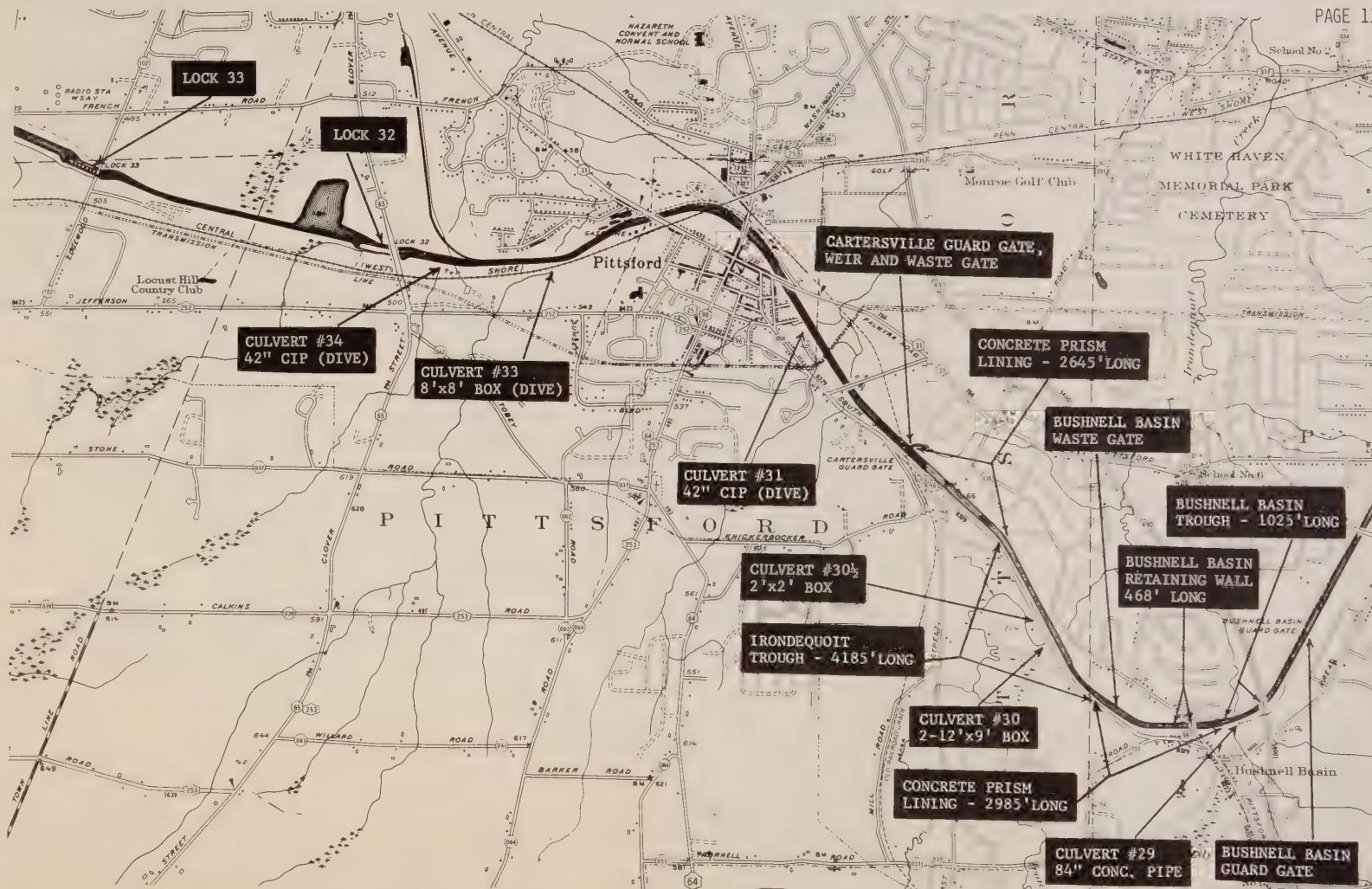
TOW PATH - narrow dirt road that runs along the edge of the canal. Originally, this road was used to tow the barges on the old Erie Canal. Presently, it serves as a maintenance and recreation road.

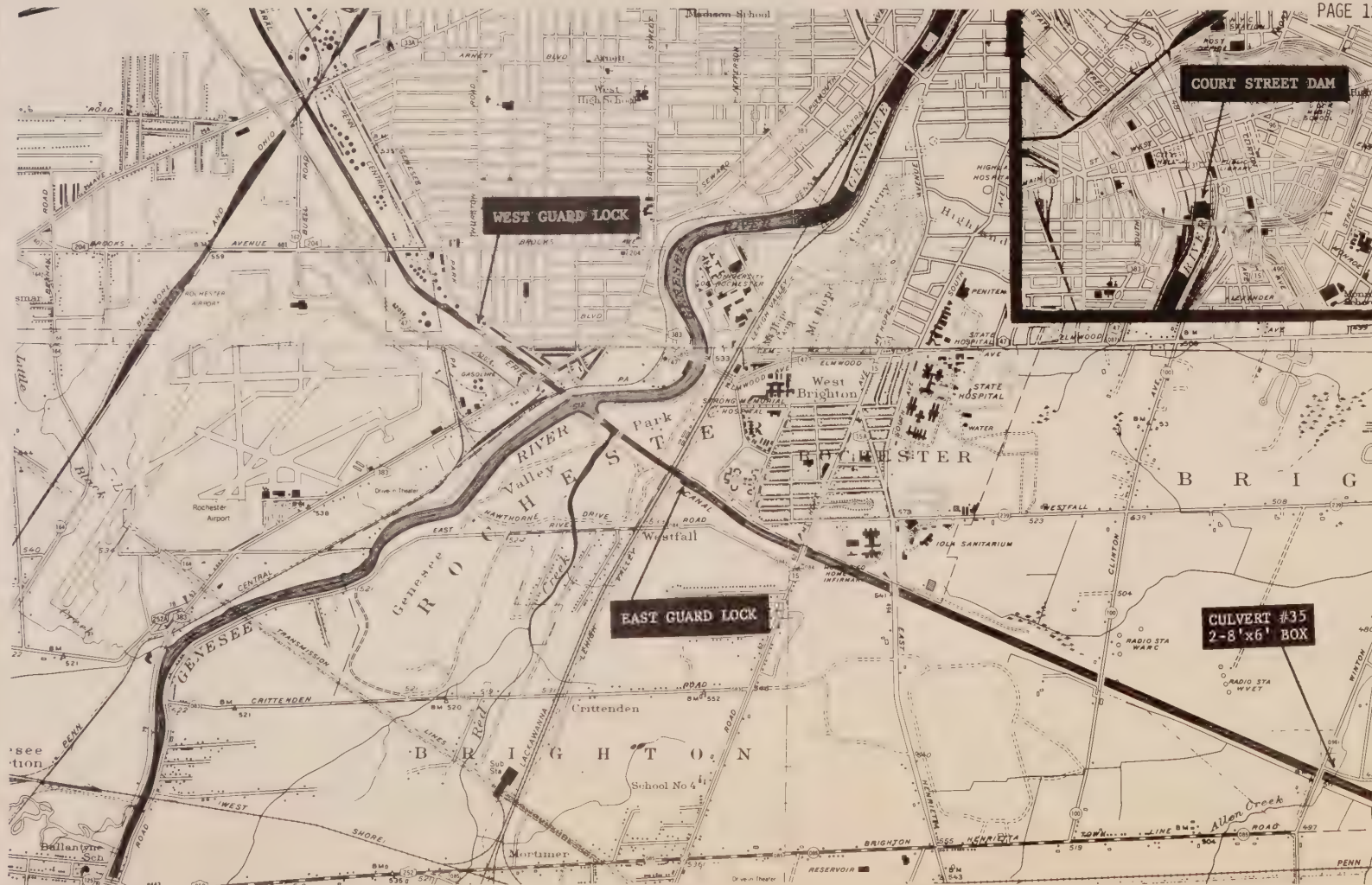
TYPICAL CONDITION - that condition which is representative and prevalent over the majority of the structure or substructure.

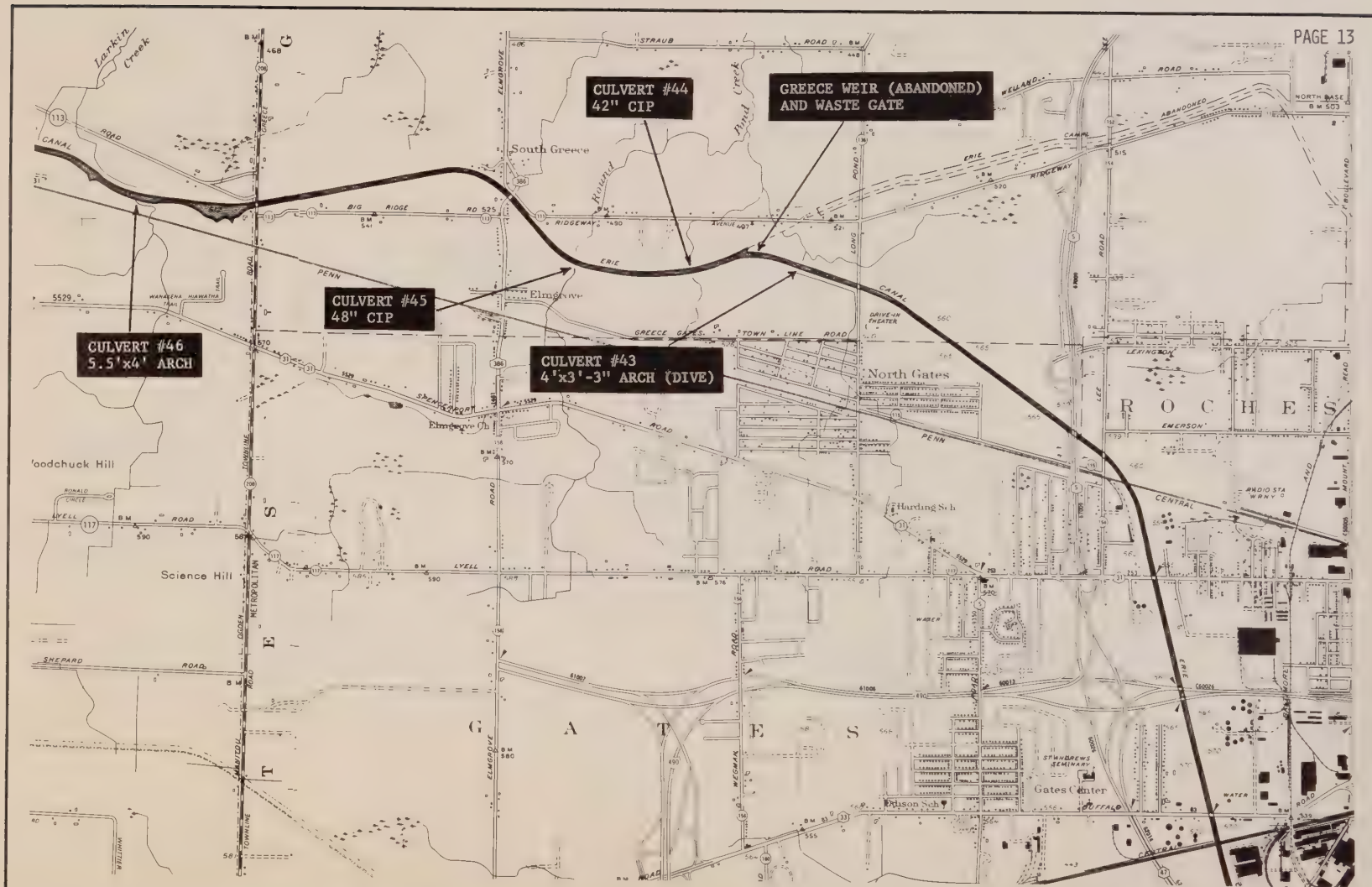
WEATHERING - the phenomenon which causes concrete disintegration resulting from exposure to the atmospheric elements.

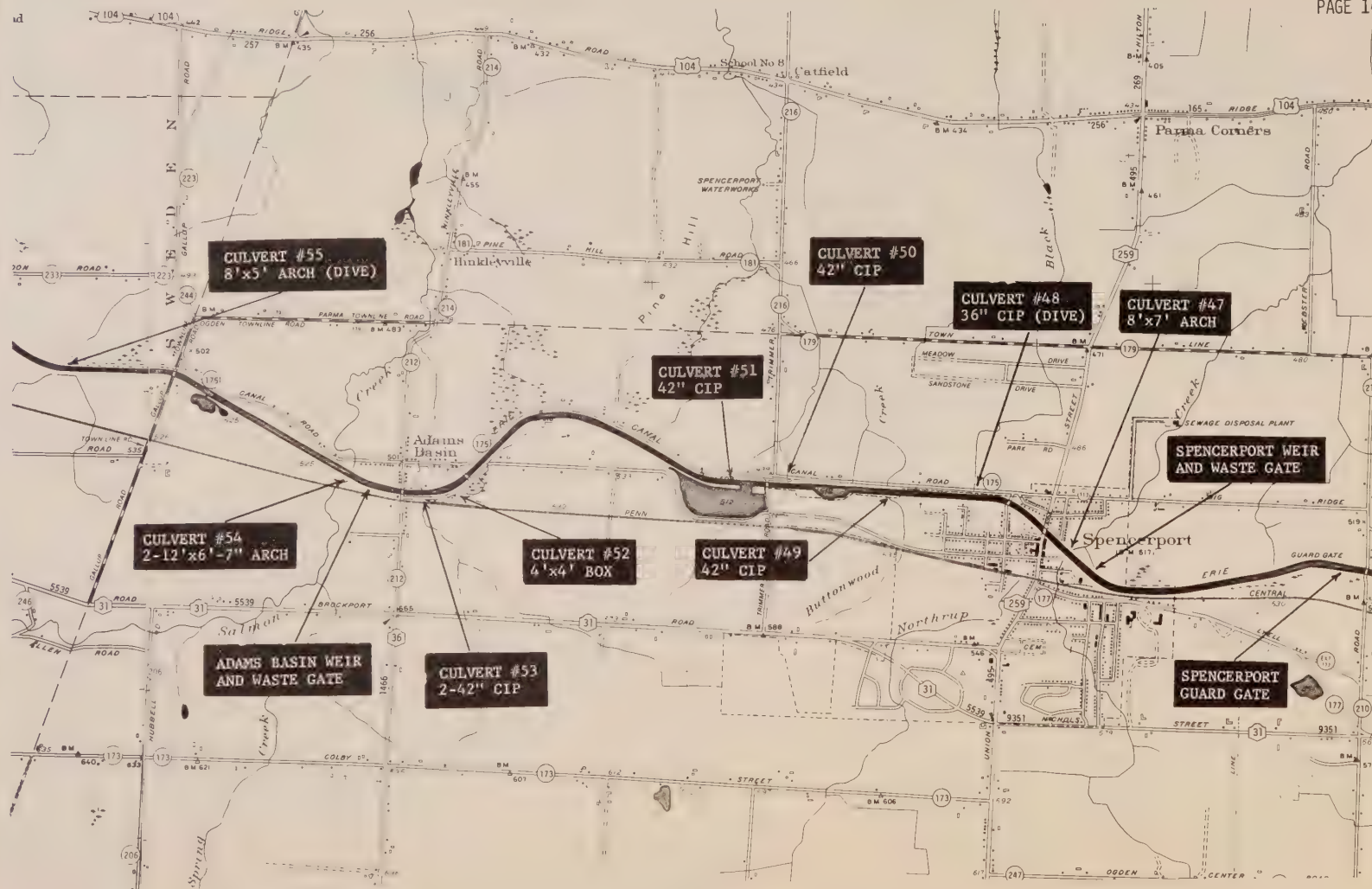
STRUCTURE LOCATIONS

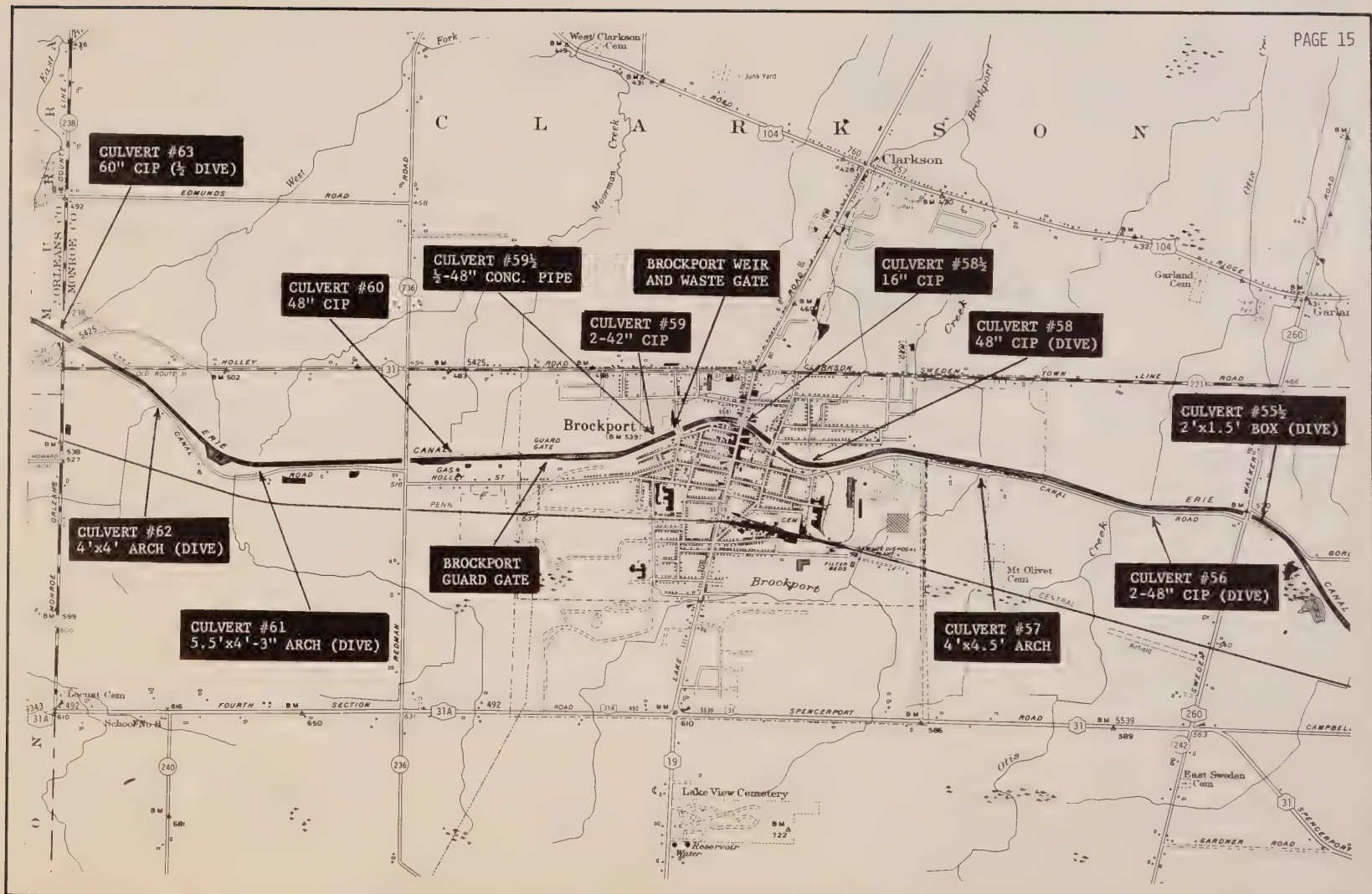


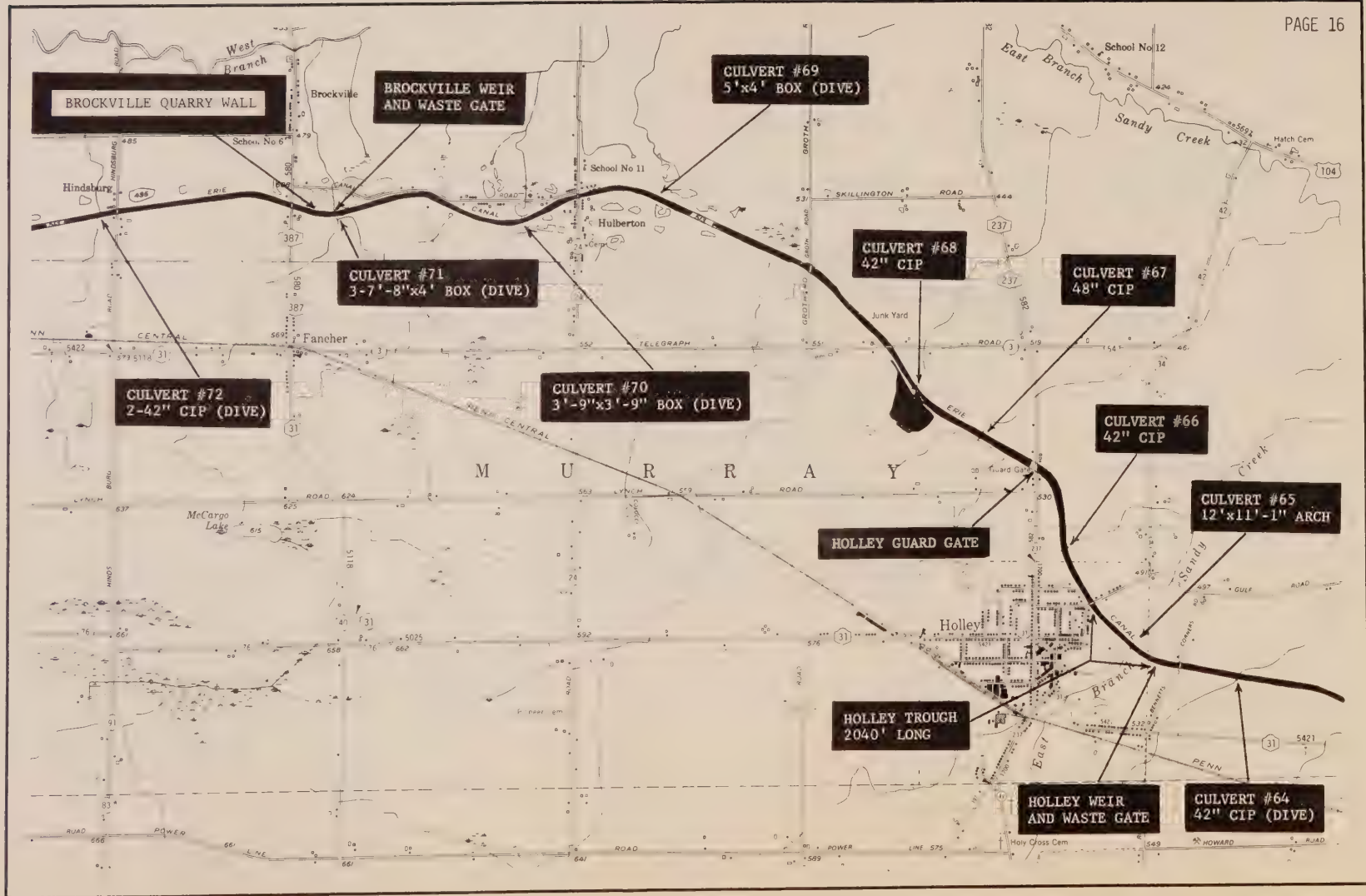


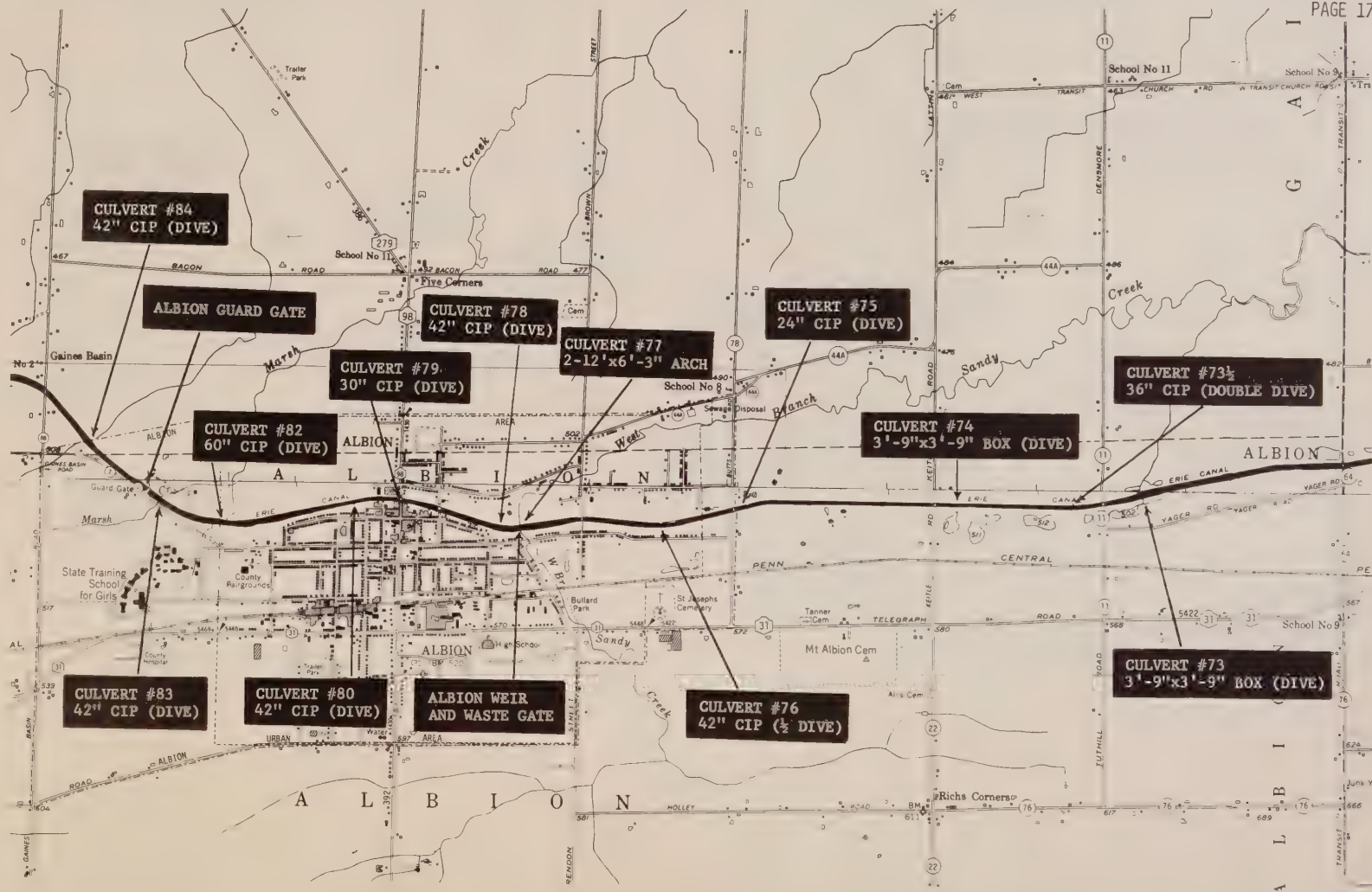


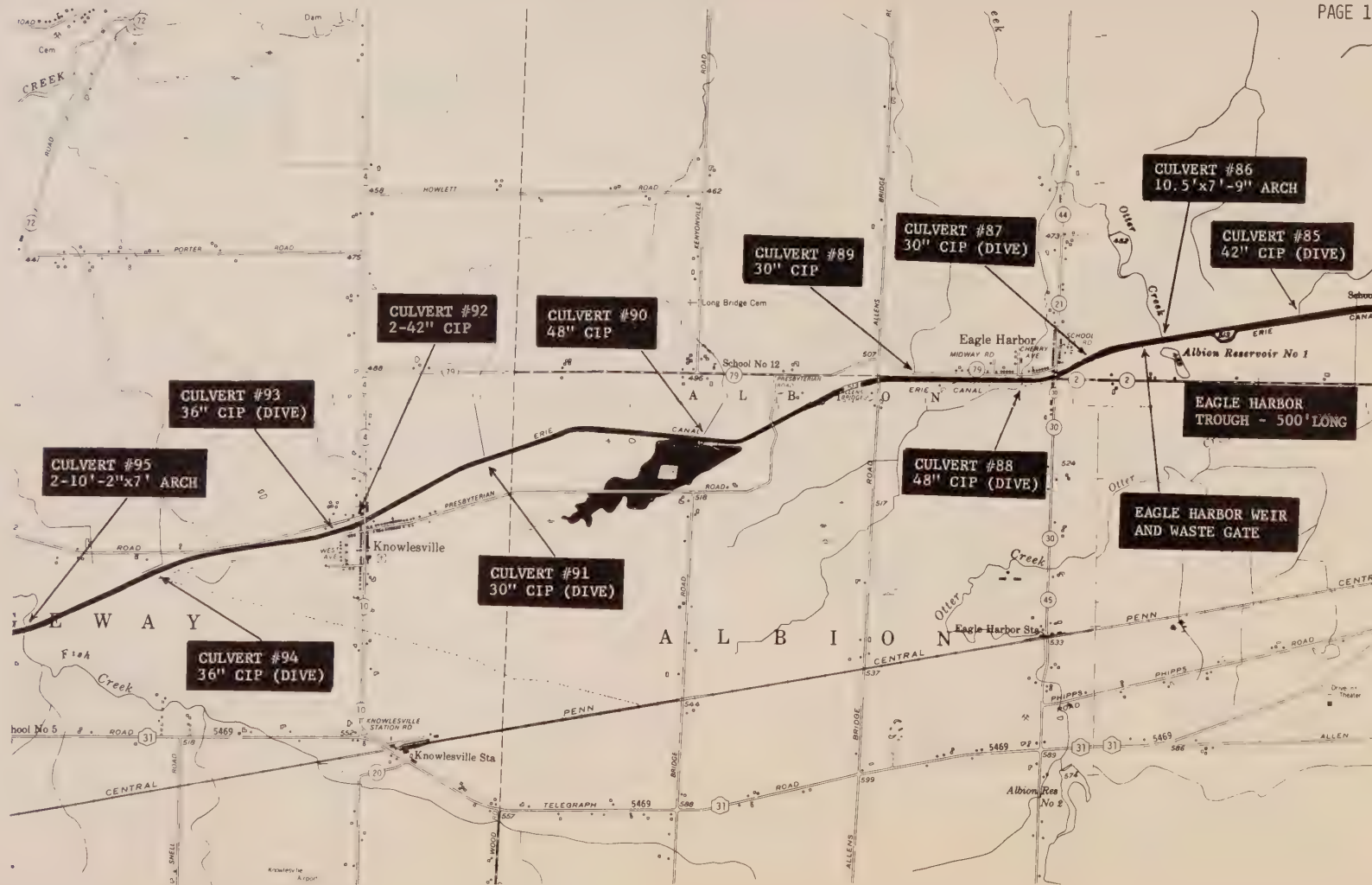


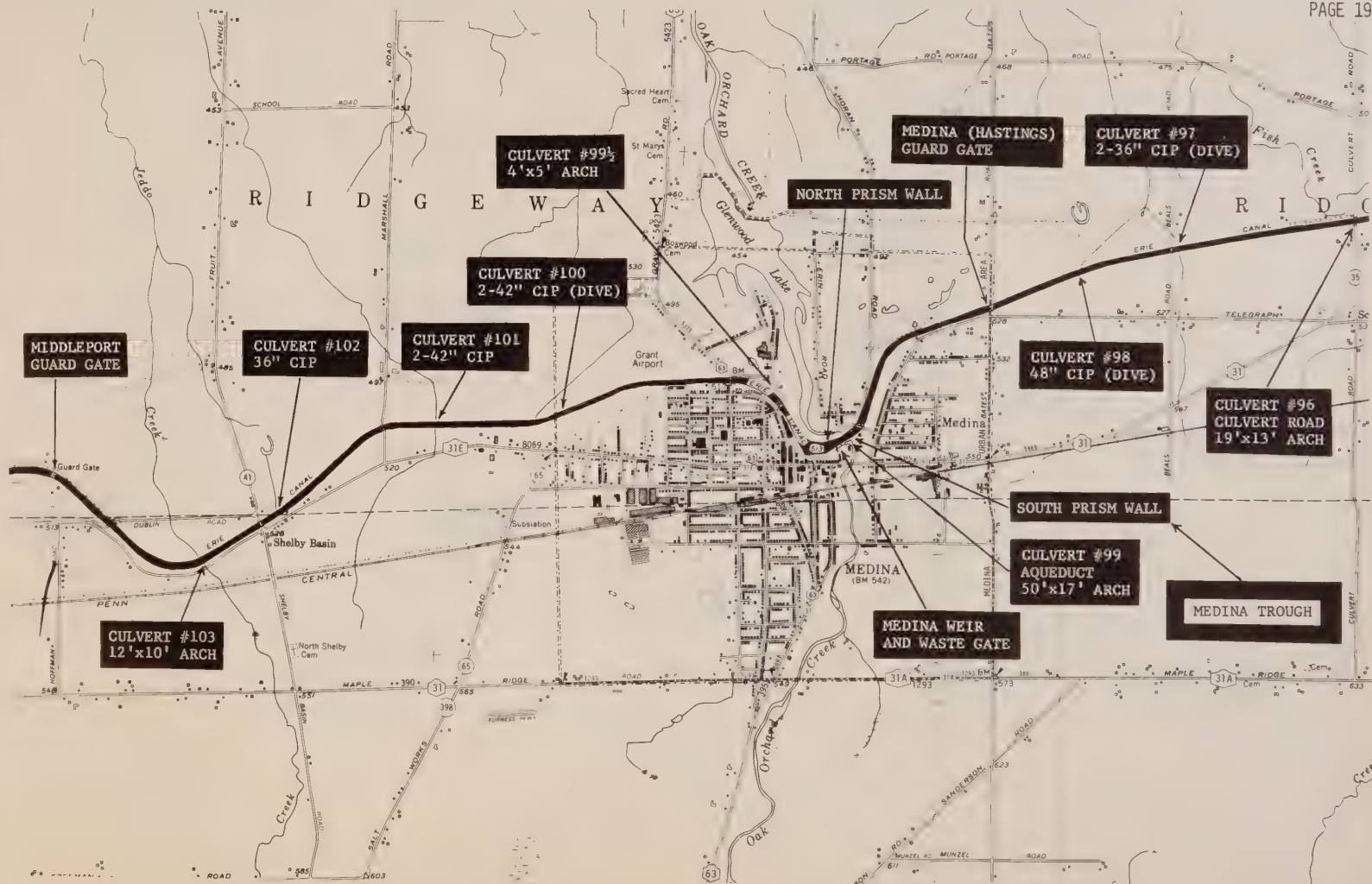


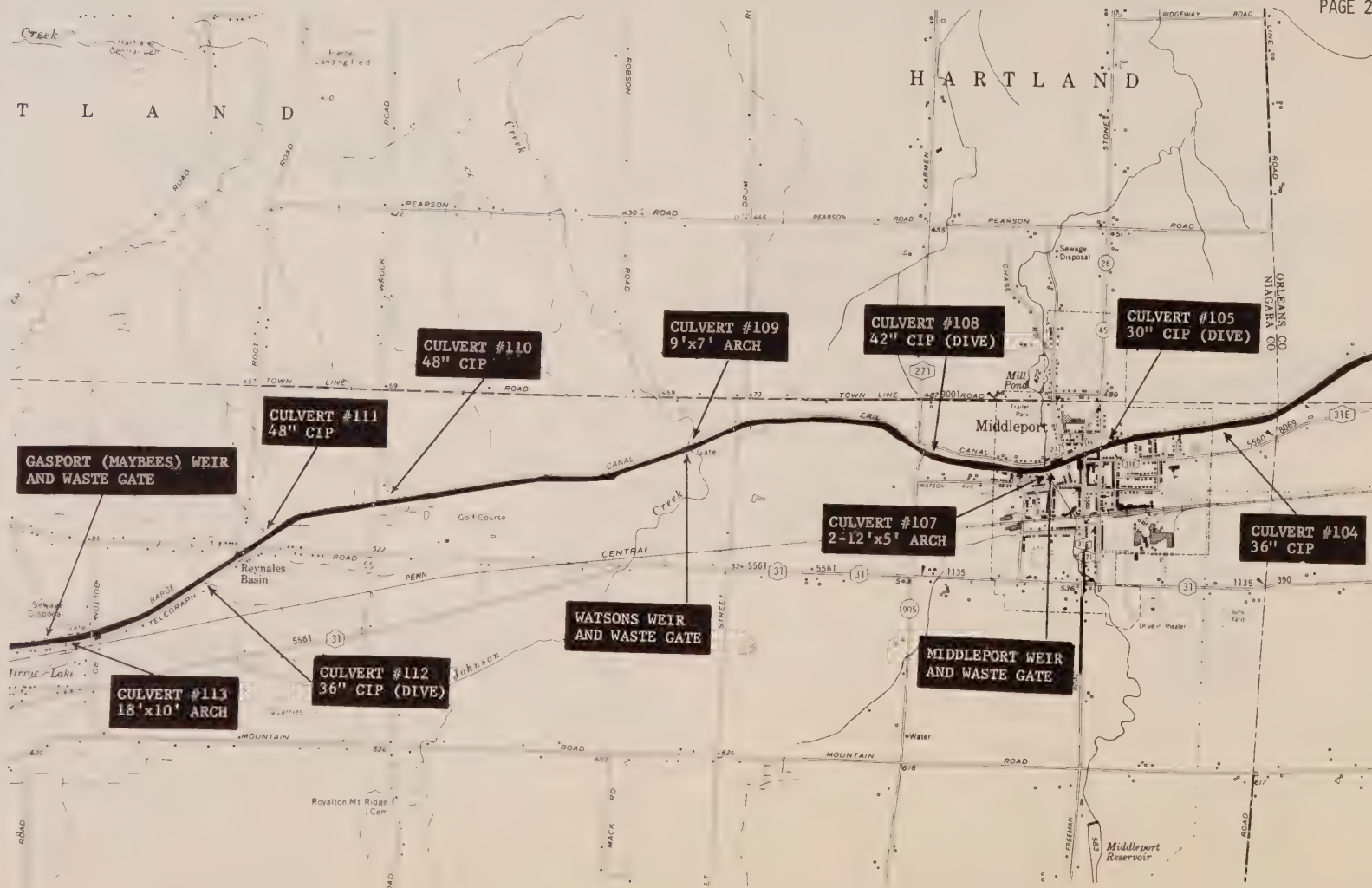


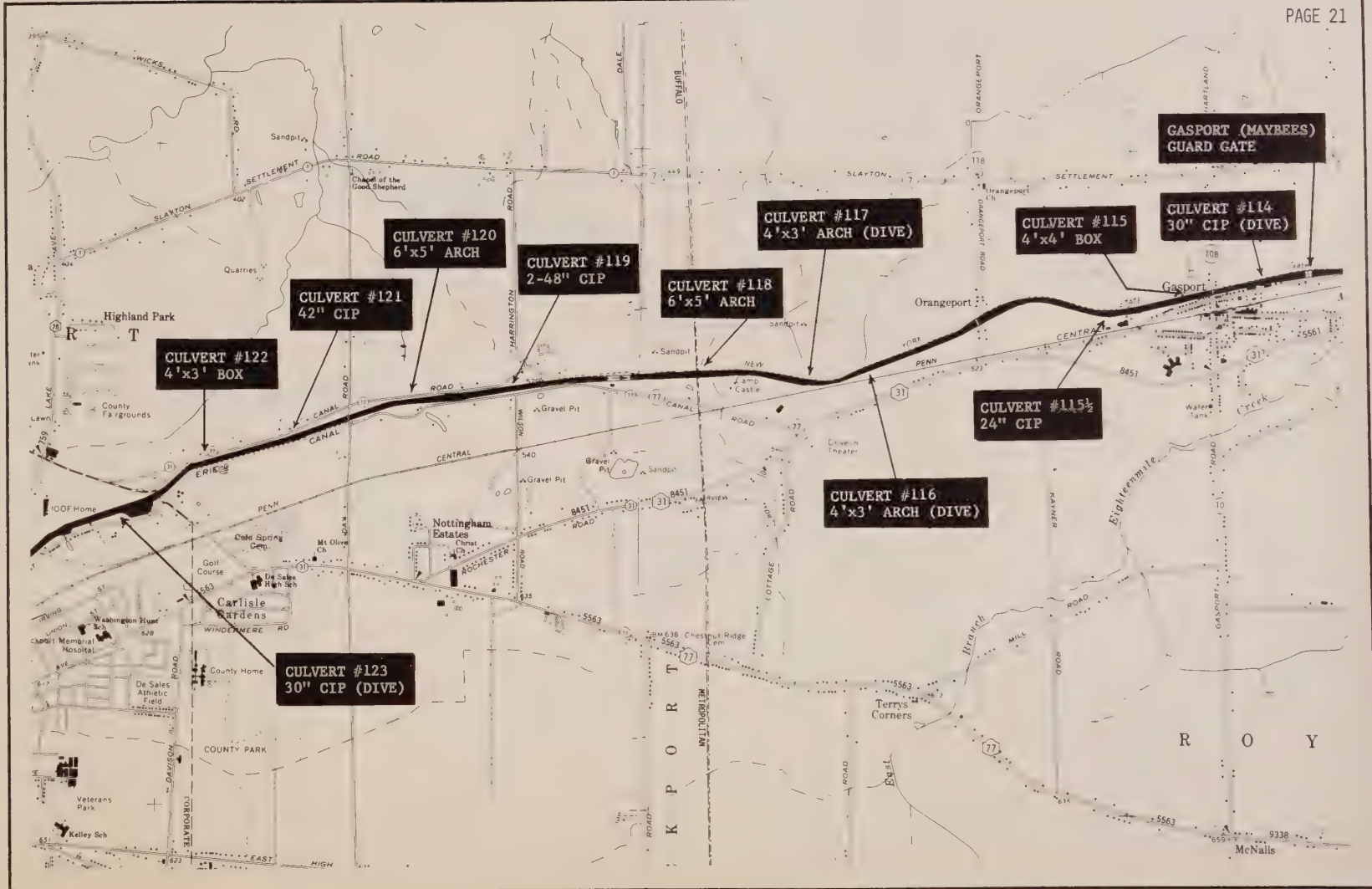






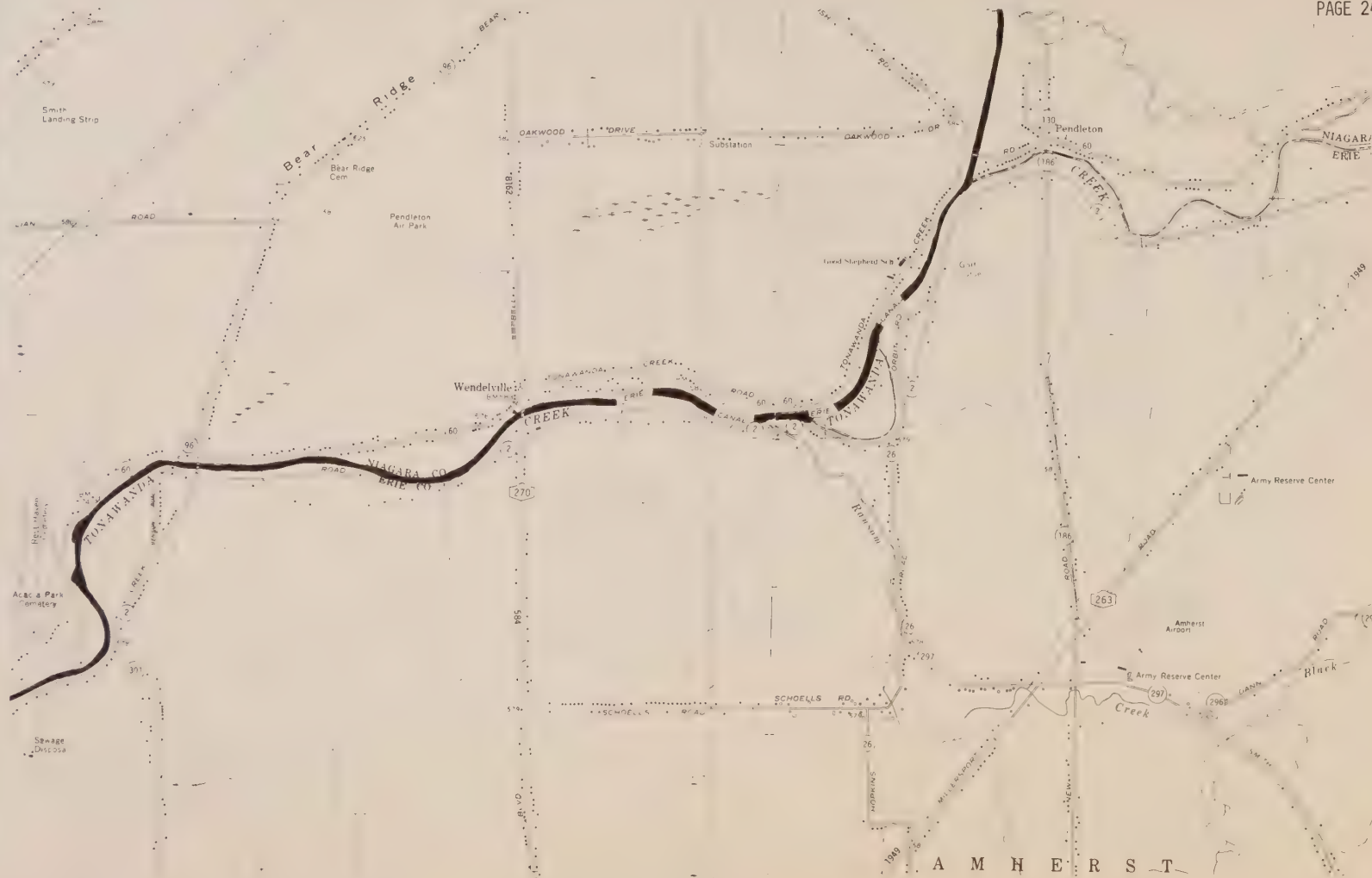


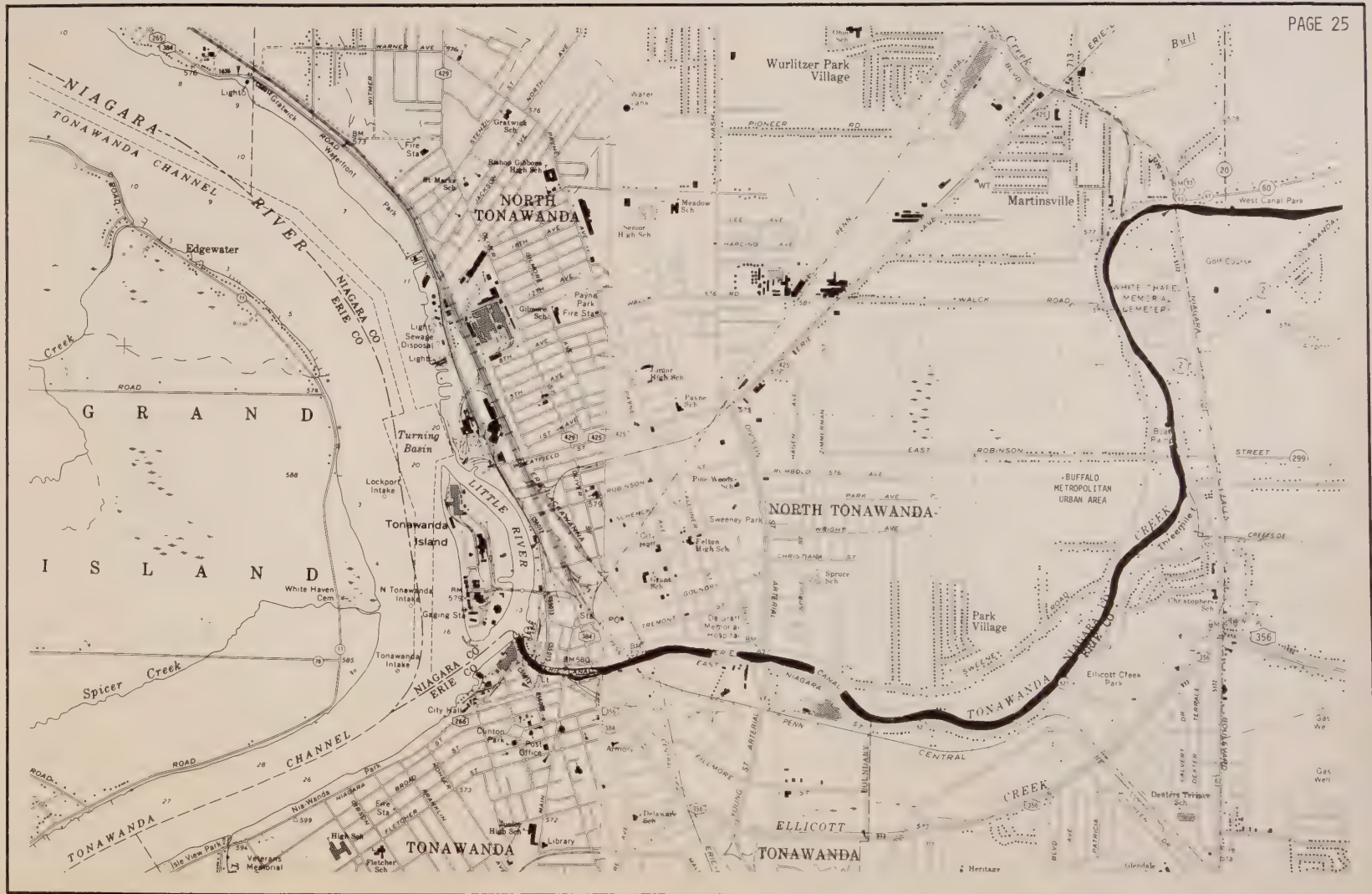












Guard gates serve only one major function on the Barge Canal. In the event of any emergency, such as a bad leak or embankment failure, they can be lowered to shut down the flow of water.

Between the West Guard Lock at the Genesee River in Rochester, and Locks 34 and 35 at Lockport, 7 guard gates were constructed. This is a distance of 59.6 miles, with the average distance between any pair of structures being approximately 7.5 miles. The maximum distance of 10.1 miles is between the Holley and Albion Guard Gates and the minimum of 4.3 miles is between the Holley and Brockport Guard Gates.

West of Lockport, the canal is in a deep rock cut section where water feeds directly from the Niagara River. Winds blowing across Lake Erie can cause wide fluctuations in the height of the Niagara River. To protect the locks at Lockport, the Pendleton Guard Gate was constructed 4.5 miles west of Lockport or 13 miles east of the river. This gate is approximately twice as high as the normal 14 foot high guard gate.

All 8 guard gates were inspected in the Spring of 1976. The Brockport, Medina and Pendleton Guard Gates appeared in

generally good condition with only localized deterioration and required that no cores be taken. Only the east side of the Pendleton Guard Gate could be inspected as water feeding directly from the Niagara River is on the west side. Evaluations of the Albion, Gasport, Holley, Middleport and Spencerport Guard Gates included cores as more extensive deterioration was present.

Nearly all the concrete walls of the guard gates contained deterioration in the top 2-3 feet. Freeze-thaw action has caused scaling, numerous cracks and delaminations, with the upper portions of some walls much more deteriorated than others.

Counterweights in the form of large concrete blocks suspended from cables help to raise and lower the steel gates. Most of these concrete blocks were covered with cracks, and pieces of concrete have begun to fall off. Some counterweights were in very poor condition.

On top of the abutments and center pier are two foot deep pits into which the counterweights are lowered when the gates are all the way up. On nearly all the guard gates, the top 2 feet of the piers and abutments seemed to be delaminated at the pit bottom level.

Sounding the guard gates to locate delaminations revealed that the pier noses on the center piers generally had a much higher percentage of delaminated concrete than the sides.

Of the 8 guard gates, 5 were constructed with concrete containing gravel coarse aggregate. The other 3 (Holley, Middleport and Spencerport) were constructed with concrete containing crushed Medina sandstone coarse aggregate. The concrete containing the Medina sandstone has, in general, deteriorated to a much greater degree than the gravel concrete.

Our recommendations include repairs to the 3 guard gates containing Medina sandstone aggregate in the near future. Two of the others (Albion and Gasport) will require repairs sometime in the future. The 3 guard gates that were not cored (Brockport, Medina and Pendleton) were still in good condition and nothing other than isolated small repairs will possibly be needed for the foreseeable future.

GUARD GATE STRUCTURES

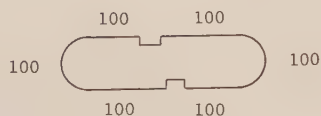
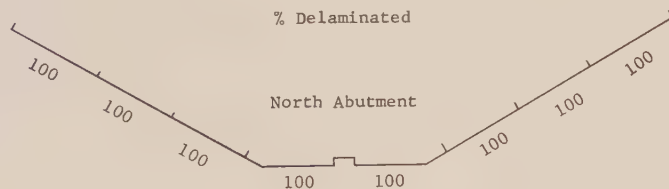
| Name | Miles Between | Milepost |
|------------------------------------|---------------|----------|
| Niagara River | | 492.3 |
| Pendleton Guard Gate | 13.0 | 479.3 |
| Lockport Locks | 4.5 | 474.8 |
| Gasport Guard Gate | 7.0 | 467.8 |
| Middleport Guard Gate | 6.4 | 461.4 |
| Medina Guard Gate | 4.6 | 456.8 |
| Albion Guard Gate | 8.4 | 448.4 |
| Holley Guard Gate | 10.1 | 438.3 |
| Brockport | 4.3 | 434.0 |
| Spencerport Guard Gate | 9.9 | 424.1 |
| West Guard Lock (Genesee River) | 8.9 | 415.2 |



East Guard Lock, Looking West
Genesee River in Distant Background

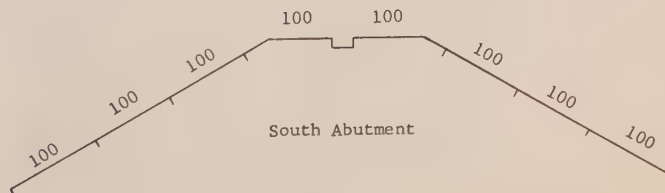
The purpose of the Genesee River Guard Locks is to allow navigation between the river and the canal while protecting the canal embankments from high river levels.

The Spencerport Guard Gate is located 1.6 miles east of Spencerport. On April 28, 1976, this structure was inspected, sounded for delaminations and 2 cores were taken from the south abutment. On April 26, 1977, a core was also obtained from the north abutment.



Medina sandstone used
in all concrete.

Tops of walls, abutments
and center pier delaminated.



Looking West
Spencerport Guard Gate



South Abutment and West End Center Pier
Spencerport Guard Gate

The south abutment was extensively delaminated and severely scaled. Cores #1 and 2, taken near the bottom of the abutment, showed that deterioration extended over $2\frac{1}{2}$ feet into the wall. The lower section of Core #2 contained 1 or 2 small fractures and had a compressive strength of 2485 p.s.i.

The north abutment appeared to be in much better condition than the south abutment. There were no severe scale areas and the walls did not sound as delaminated. However, Core #3 showed that deteriorated concrete extends over 2 feet into the wall.

Both ends of the center pier were beginning to show signs of scaling and many cracks were observed along the sides. It appeared that all sides of the center pier contained deteriorated concrete.

Deterioration was noted along the top of all concrete walls and the center pier. Numerous cracks, scaling and delaminations indicate that the top 2 - 3 feet have been seriously affected.

This structure was built with concrete containing crushed Medina sandstone as the coarse aggregate. Concrete deterioration in those few structures containing Medina sandstone has been generally found to be much more extensive and deeper than those containing gravel aggregates.



North Abutment and West End Center Pier
Spencerport Guard Gate



North Abutment and East End Center Pier
Spencerport Guard Gate

CONCLUSION

The concrete in the south abutment contained fractures which extend halfway or more into most of the walls. Center pier and north abutment concrete deterioration appears to be less, but also extensive.

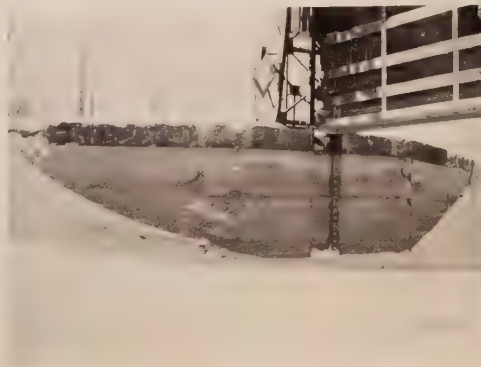
Required repairs include replacement of the top 2 - 3 feet of concrete on the walls and pier, and complete replacement or very extensive repair to the south abutment. Also, over 2 foot deep repairs are needed on the north abutment and on the sides of the center pier. Because of extensive deterioration in the south abutment, repairs to this structure are recommended now.



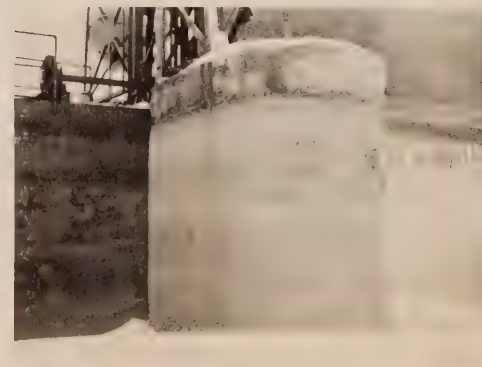
East End Center Pier
Spencerport Guard Gate



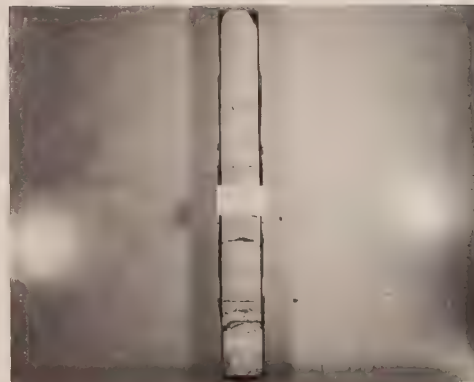
North Abutment
Spencerport Guard Gate



South Abutment
Spencerport Guard Gate

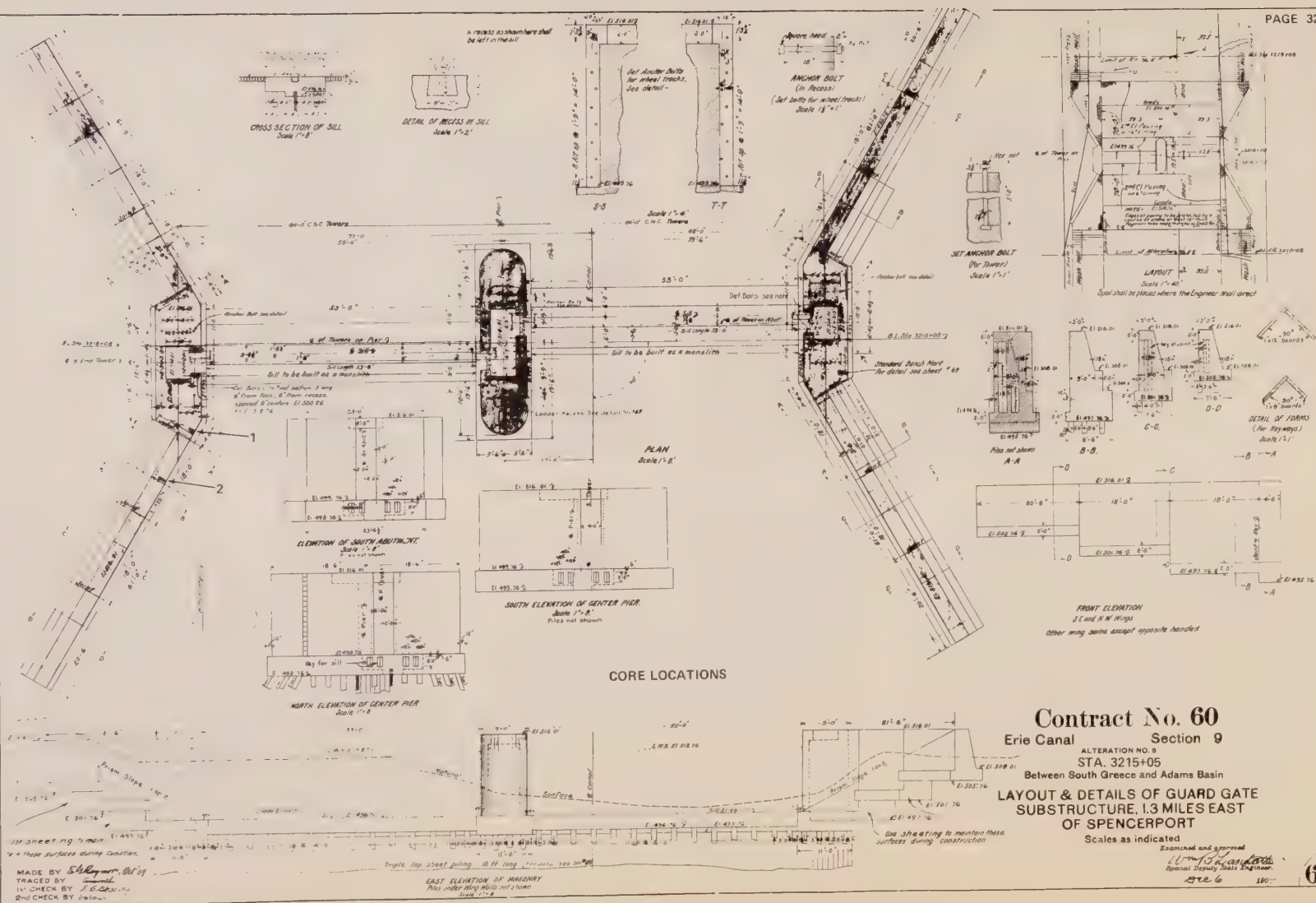


West End Center Pier
Spencerport Guard Gate



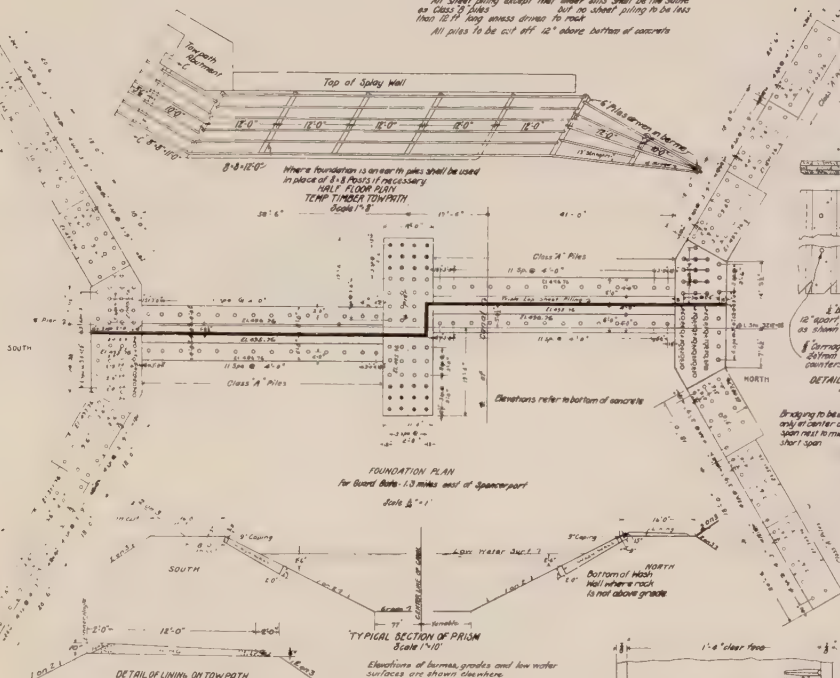
SPENCERPORT GUARD GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|---|
| 1 | South Abutment, 1½' From Joint With East Splay Wall, 3' Above Bottom | 0 | 26½" | 0 | 26½" | 26½" | Very hollow sounding. Core next to 1' deep scale area. Deeper deterioration exists. |
| 2 | South Abutment, East Splay Wall, 10' From Joint With Abutment, 3' From Bottom | 0 | 30" | 0 | 30" | 30" | Slightly hollow sounding. Typical wall area. Deeper deterioration exists. |
| 3 | North Abutment, Middle of West Splay Wall Next to Abutment, 3' From Bottom | 0 | 27" | 0 | 37" | 37" | Wall sounds slightly hollow everywhere. Typical wall area. |



NOTES FOR PULP

All piles shall be of Class B except as otherwise shown
Battered piles are shown thus: ●
All sheet piling except that under ails shall be the same
as Class B piles but no sheet piling to be less
than 12 ft long unless driven to rock
All piles to be cut off 12" above bottom of excavation



DETAIL OF LINING ON TOWPATH
Scale 1"=4'

Lining for towpath shall be placed as the Engineer shall direct. The lining shall be placed as to connect with the temporary towpath.

WTF.

NOTES
All concrete shall be second class, unless otherwise shown.
All exposed edges of concrete shall be rounded to a radius
of 3" unless otherwise noted.
Edges of joints shall be rounded to a $\frac{1}{2}$ " radius

The bases of structures shown on the plans shall be considered as approximate only and may be ordered by the Engineer to be of any elevation or of any dimensions necessary to give a proper foundation.

running crosswise of the wall shall be formed in the last layer of concrete in each structure. These keyways shall be not less than 12" deep and 24" wide and their ends shall be 18" from faces of finished concrete.

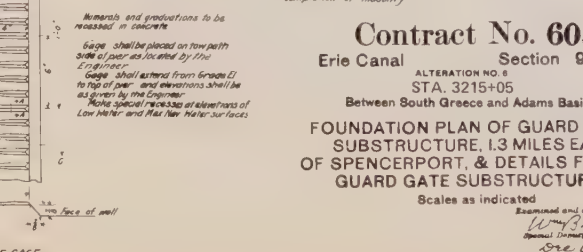
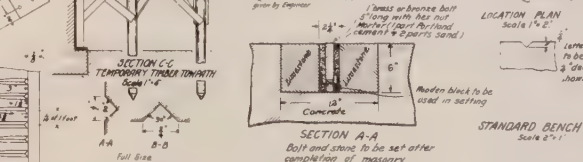
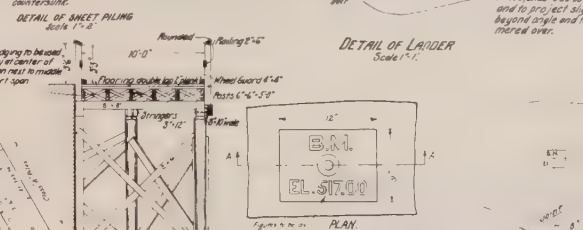
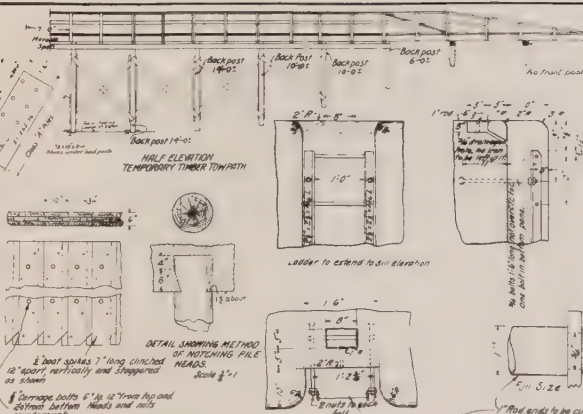
Location of spot bamboo shall be as ordered by the Engineer.
Round poles Class A to be used for front posts of temporary, unless otherwise ordered by the Engineer. The same to be paid for

Back posts to rest on front projection of footing course of abutments and spring walls and to be set before back fill is made or no excavation to be allowed for same if done after above is made

Tops of piles to be squared to 8" x 8" and floor beams secured to each pile and post by two 5" x 16" creek pieces
Fence posts to be fastened to outside stringers with 2" x 9" or bolts and nuts and

Diagonal bracing to be fastened to posts with $\frac{1}{2}$ bolts and nuts and if necessary posts to be rabbeted to give braces firm bearing.

Each course of flooring fastened by one 20d nail, each plank & each string staggered and two at each outside stringer



Contract No. 60.

Erie Canal Section 9

ALTERATION NO. 8
STA. 3215+05

South Greece and

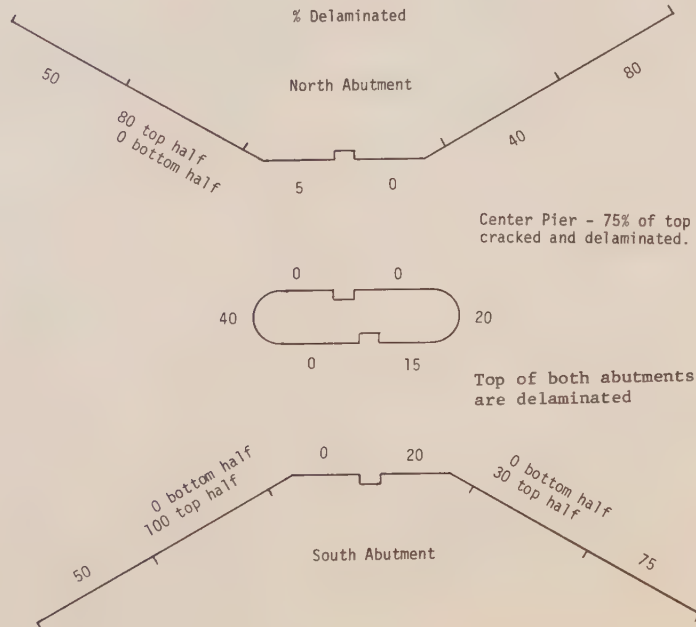
FOUNDATION PLAN OF GUARD

SUBSTRUCTURE, 1.3 MILES EAST
OF SPENCERPORT, & DETAILS FOR
GUARD GATE SUBSTRUCTURE

Scales as indicated

Examined and approved
Wm B Landolt
Special Duty ~~and~~ Engineer
Dec 6 1900

The Brockport Guard Gate is located 1 mile west of downtown Brockport. On March 31, 1976, this structure was visually inspected and sounded for delaminations. Due to the lack of any large areas of visual deterioration, no cores were taken from this structure.



Looking West
Brockport Guard Gate



North Abutment
Brockport Guard Gate

Except for the top portions of all walls, the majority of delaminated concrete was found in the splaywalls on both sides of the abutments. Some scaling has occurred on these walls below the waterline, but all wall faces appeared in generally good condition. The abutments sounded in especially good condition with very little delaminated concrete.

The center pier also contained little delaminated concrete, except for the pier noses. Both noses contained a much higher percentage of delaminated concrete than the sides, but all faces still appeared in good condition.



North Side Center Pier
Brockport Guard Gate



East Half South Abutment
Brockport Guard Gate



West Half South Abutment
Brockport Guard Gate

The most prevalent concrete deterioration on the structure has occurred to the top 2-3 feet above the waterline. Freeze-thaw action in this area has caused numerous cracks, scaling and delaminations. However, the concrete is still generally intact and will probably remain so for many years.

Conclusion

During sounding, many sections of the structure did not seem to contain delaminated concrete. However, cores from other structures showed that very tight fractures can exist in these sections and not be detected by sounding.

Future repairs to this structure should include replacement of the concrete in the top 2-3 feet of the walls and pier. Also, all sections of the walls and pier faces which contain delaminated concrete should be repaired by removing the concrete to an approximate depth of 8-12 inches and bonding on a new concrete surface.

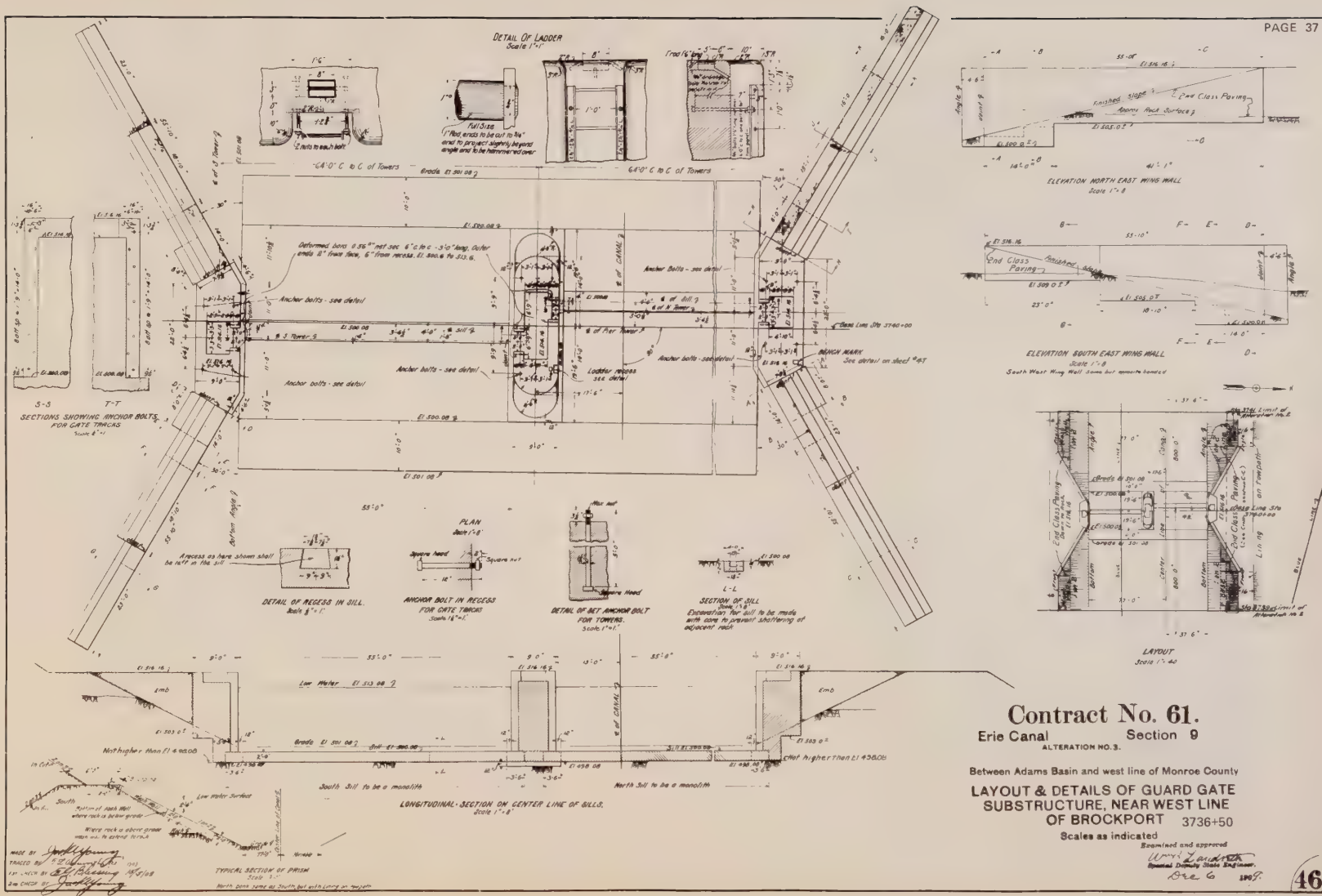
Overall, the structure is still in relatively good condition and we recommend no immediate concrete repairs.



South Side Center Pier, West End
Brockport Guard Gate

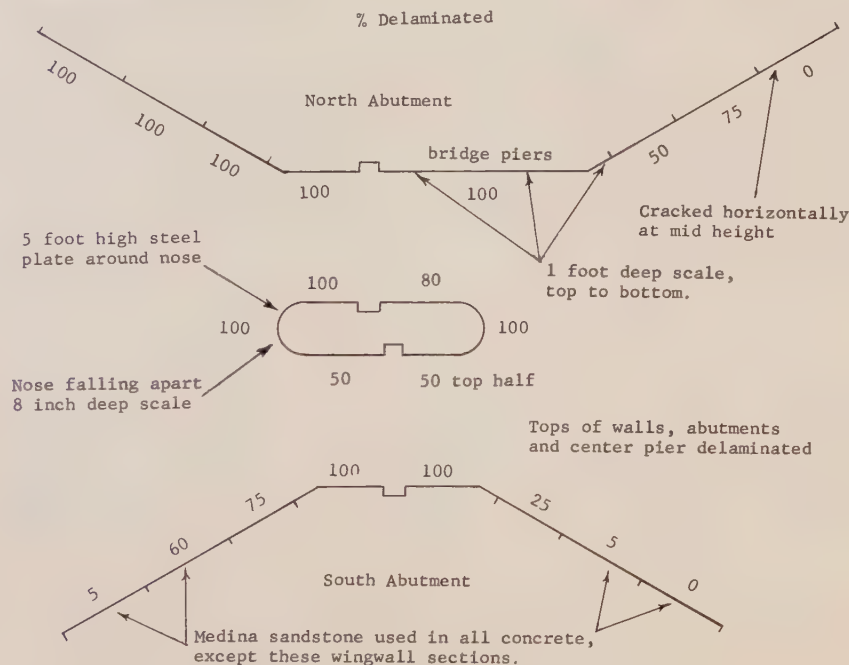


South Side Center Pier, East End
Brockport Guard Gate

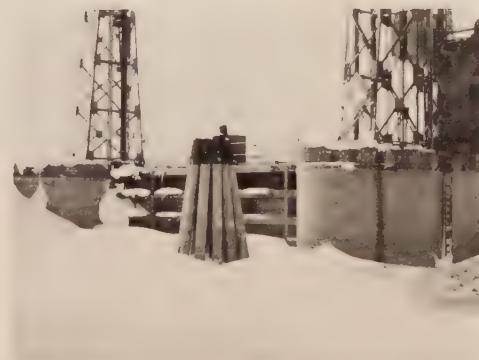


The Holley Guard Gate is located 1 mile north of Holley.

On April 9, 1976, this structure was inspected, sounded for delaminations and cored.



Looking West
Holley Guard Gate



East Half South Abutment and Center Pier
Holley Guard Gate

As was observed in the majority of guard gates, the upper 2-3 feet of concrete in the center pier and walls contained numerous delaminations, cracks and scaled areas caused by freeze-thaw action.

The majority of the walls on the entire structure contained extensive delaminations. The north abutment, under the bridge, exhibited areas of scaling 1 foot deep caused by joint leakage. Deep scaling also existed on other areas of the structure. Core #1, taken from under the bridge, contained deterioration 17 inches deep with deeper deterioration existing in adjacent scaled areas.

The west nose of the center pier was disintegrating and a 5 foot high steel plate has been wrapped around the upper end to hold it together. Other areas of the pier were in much better condition. Core #2, taken from a solid sounding area on the north side of the pier, contained deterioration only $6\frac{1}{2}$ inches deep. The lower portion of this core had a compressive strength of 4875 p.s.i. even though it contained 1 or 2 small fractures.



West Half South Abutment and Center Pier
Holley Guard Gate



East Half South Abutment and Center Pier
Holley Guard Gate



West Half North Abutment and Center Pier
Holley Guard Gate

The splaywalls at both ends of the south abutment were in much better condition than the other portions of the abutment. Gravel aggregate was used in the concrete for the splaywalls while crushed Medina sandstone was used as the concrete aggregate in the other portions of the structure.

Concrete deterioration in those few structures containing Medina sandstone has been generally found to be much more extensive and deeper than those containing gravel aggregates.

Conclusion

The walls of the north abutment under the bridge contain fractures which extend halfway or more through the walls. Other areas of the abutments and pier also contain deep deterioration. Because of this extensive deterioration, repairs are recommended for the near future.

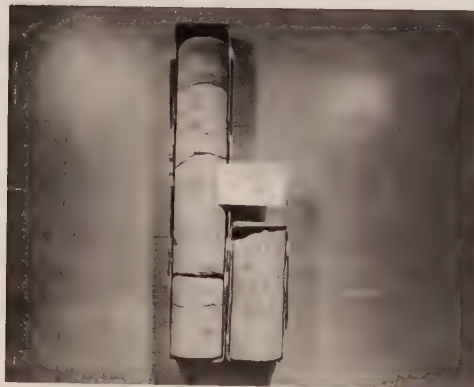
Recommended repairs include replacement of the concrete in the top 2-3 feet of all walls and pier, and complete replacement or very extensive repair of the north abutment under the bridge. Also, 1-2 foot deep repairs are required in the other areas of delaminated or scaled concrete.



West Half North Abutment
Holley Guard Gate

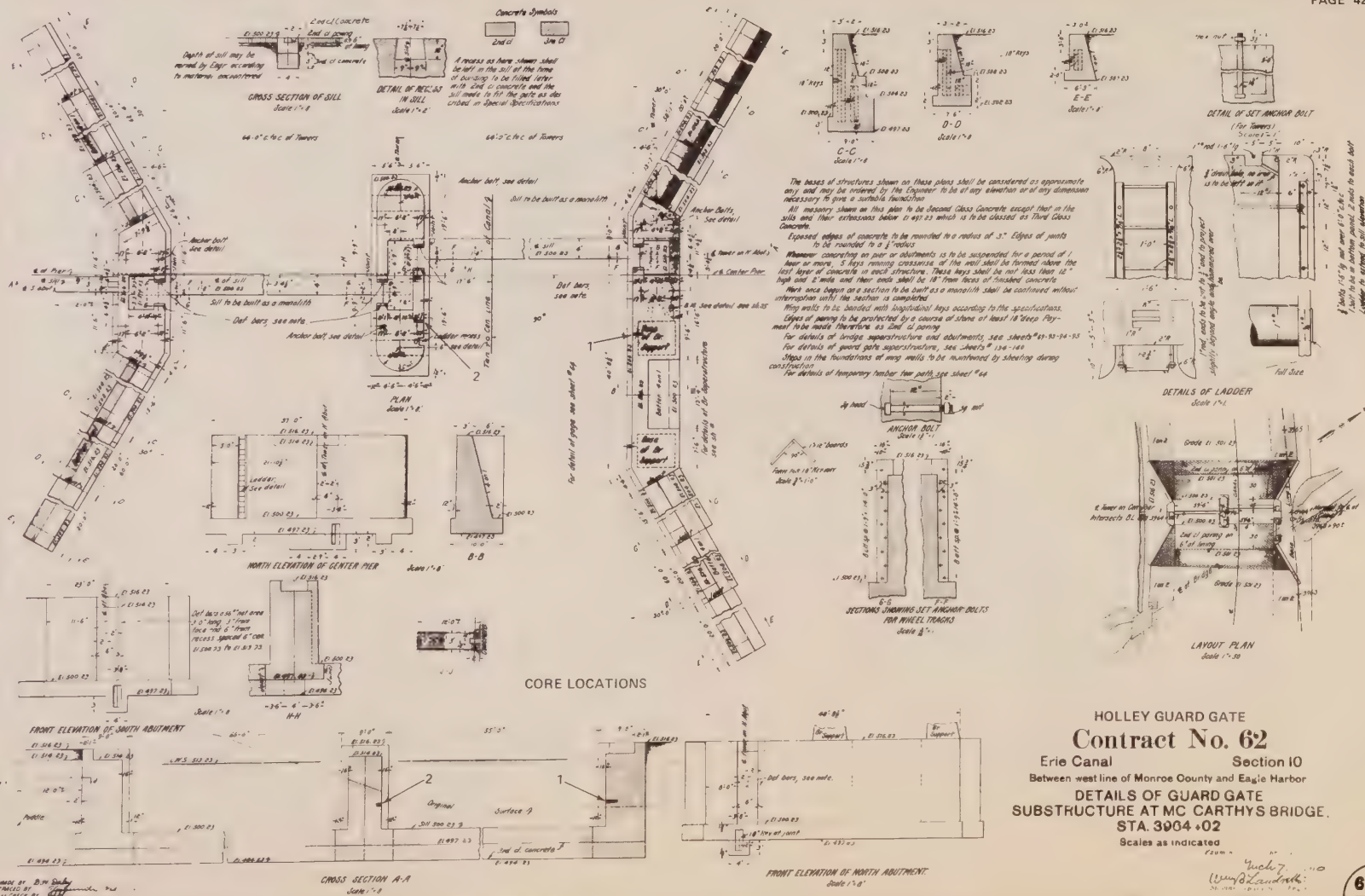


East Half North Abutment
Holley Guard Gate

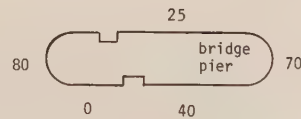
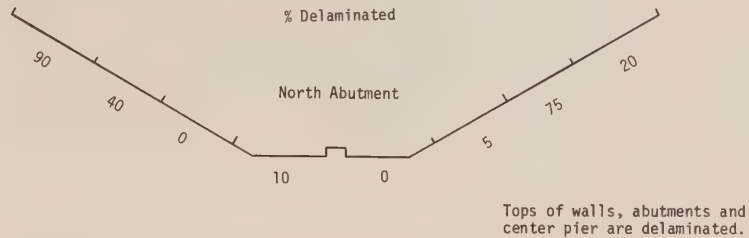


HOLLEY GUARD GATE

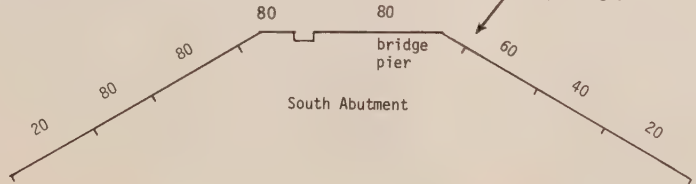
| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|---|
| 1 | Center of North Abutment, 4' Above Ground | 0 | 17" | At 14" | 23½" | 23½" | Best hollow sounding area. Cored into large stone. |
| 2 | Center Pier, North Side, 10' From East End, 4' Above Ground | 0 | 6½" | 0 | 9½" | 9½" | Solid sounding area. |



The Albion Guard Gate is located 1.4 miles west of downtown Albion. On April 7, 1976, this structure was visually inspected, sounded for delaminations and 2 cores were taken from the south abutment.



Top 4 feet of south abutment has been repaired.



Looking East
Albion Guard Gate



West Half South Abutment and Center Pier
Albion Guard Gate

On the north abutment the majority of delaminated concrete was found in the splaywalls. Very little delaminated concrete was detected near the center of this abutment. Also, some sections of the top 2-3 feet of the abutment were completely delaminated.

The center pier contained extensive areas of delaminated concrete on the noses and on the top. Deep scaling has occurred in areas along the top, but overall the concrete was still intact. As this pier also supports a steel column for an overhead bridge, it is longer than the other guard gate piers.

The south abutment contained very extensive areas of delaminated concrete, many cracks, and a few deep scale areas. Repairs to the top 4 feet of the center of this abutment have recently been made.

The 2 cores were taken near the bottom of the abutment. Core #1, from a hollow sounding area, contained deterioration



East Half South Abutment and Center Pier
Albion Guard Gate



East Half North Abutment and Center Pier
Albion Guard Gate

8 inches deep. Core #2, from a solid sounding area, contained deterioration 7 inches deep. The fractures in Core #2 were not detected by sounding because they were very tight and the concrete was still acting as a solid piece. The lower section of Core #1 had a compressive strength of 3775 p.s.i. even though it contained 1 or 2 small fractures.

Freeze-thaw action has caused numerous cracks, scaling and delaminations along the top 2-3 feet of the structure. The south abutment and center pier appeared to contain the most deterioration.

Conclusion

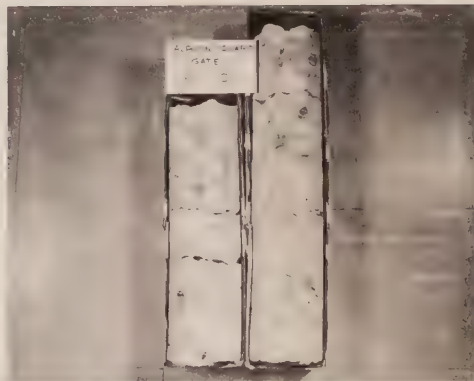
During sounding, some concrete areas did not seem to contain delaminated concrete. However, cores from this and other structures showed that tight fractures can exist in these areas and not be detected.

Although large areas of this structure are still in relatively good condition, future concrete repairs are recommended for the more seriously deteriorated areas.

These repairs should include replacement of the concrete in the top 2-3 feet of the walls and pier. Also, all sections which contain delaminated concrete should be repaired by removing the existing concrete to an approximate depth of 8-12 inches and bonding on a new concrete surface.

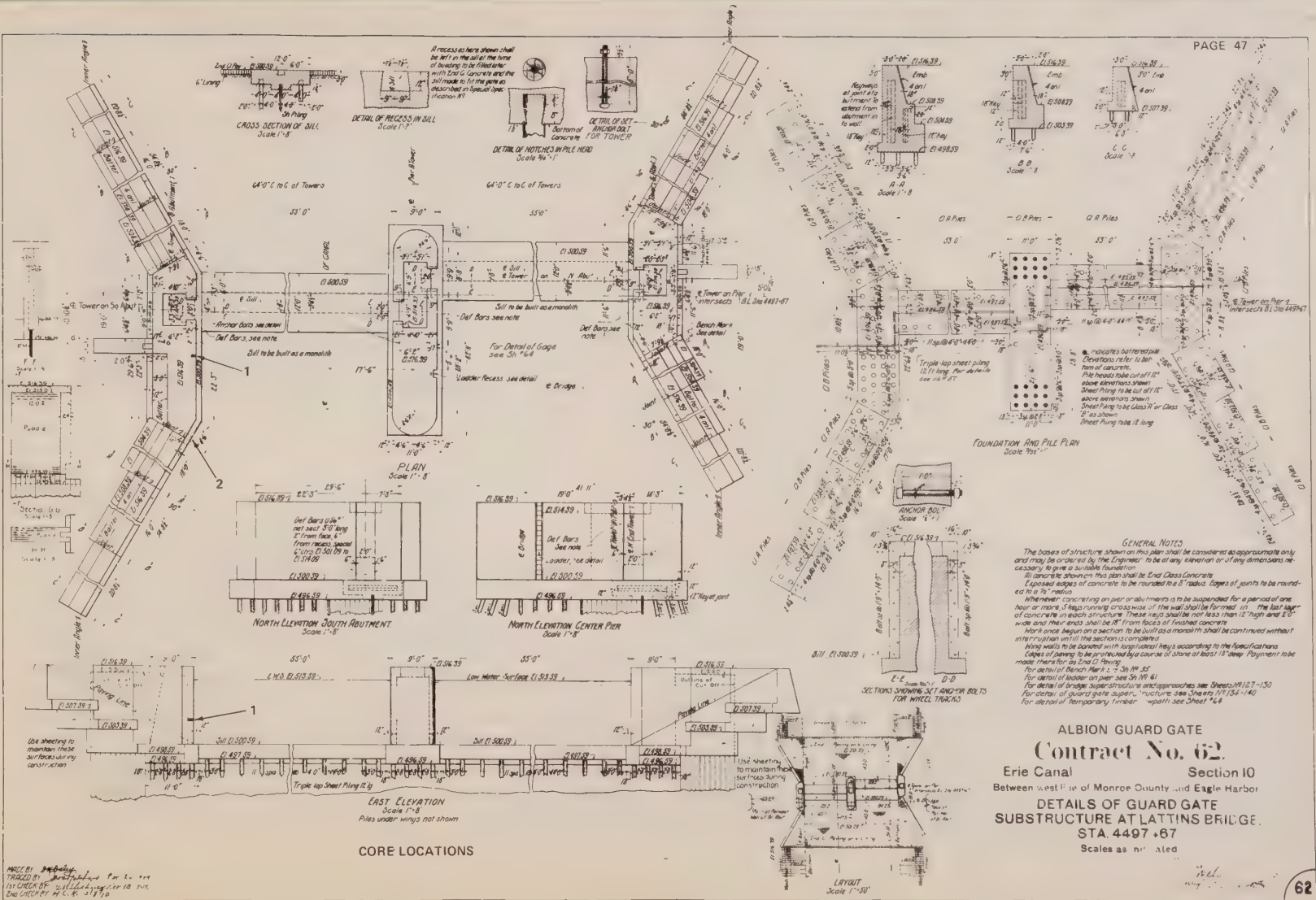


West Half North Abutment and Center Pier
Albion Guard Gate



ALBION GUARD GATE

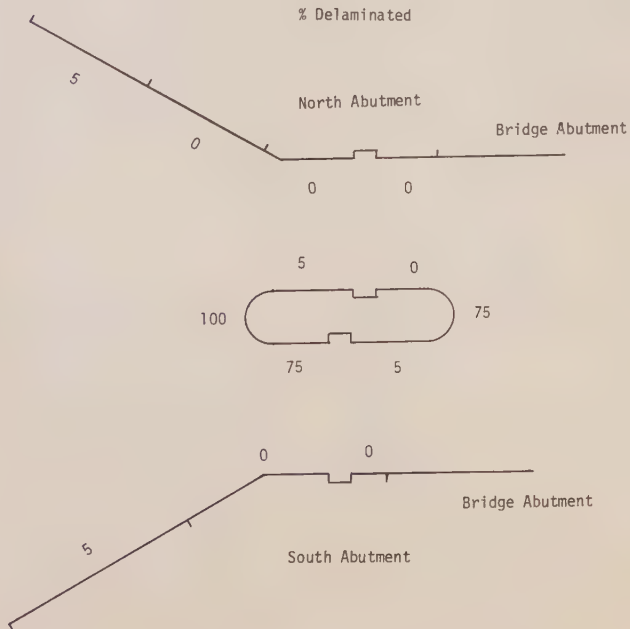
| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|-----------------------|
| 1 | South Abutment, 10' East of Gate, 4' Above Ground | 0 | 10½" | 0 | 13½" | 13½" | Hollow sounding area. |
| 2 | South Abutment, East Splay Wall, 4' From Joint With Abutment, 4' Above Ground | 0 | 7" | At 4", 8" and 14" | 18" | 18" | Solid sounding area. |



ALBION GUARD GATE
Contract No. 62.
 Erie Canal Section 10
 Between west 11th of Monroe County and Eagle Harbor
DETAILS OF GUARD GATE
SUBSTRUCTURE AT LATTINS BRIDGE.
STA. 4497+67
 Scales as notated

MADE BY: [Signature]
 CHECKED BY: [Signature]
 IN CHARGE OF: [Signature]
 ENGINEER: [Signature]

The Medina Guard Gate is located 1.2 miles northeast of downtown Medina. On April 1, 1976, this structure was inspected and sounded for delaminations. No large areas of visual deterioration were noted on a previous inspection and, therefore, no cores were obtained from this structure.



Looking East
Medina Guard Gate



West Half Center Pier and South Abutment
Medina Guard Gate

The most prevalent concrete deterioration on the structure has occurred to the top 2-3 feet above the water line. Freeze-thaw action in this area has caused numerous cracks, scaling and delaminations. However, the concrete was still generally intact and will probably remain so for many years.

Very little delaminated concrete was detected on either abutment. All wall faces appeared in good condition with only very small areas of scale or other deterioration noted.

The north side of the center pier appeared in good condition. Both noses and the southwest side contained areas of delaminated concrete and some small areas have started to scale.

Conclusion

During sounding, most concrete areas did not seem to contain delaminated concrete. However, cores from other structures showed that very tight fractures can exist in these areas and not be detected.

The concrete in the structure is still in relatively good condition and no repairs are necessary at this time. Future repairs will require that the top 2-3 feet of the walls and pier be replaced. All delaminated concrete in the wall and pier faces will require removal to an approximate depth of 8-12 inches with new concrete bonded on to form a new surface.



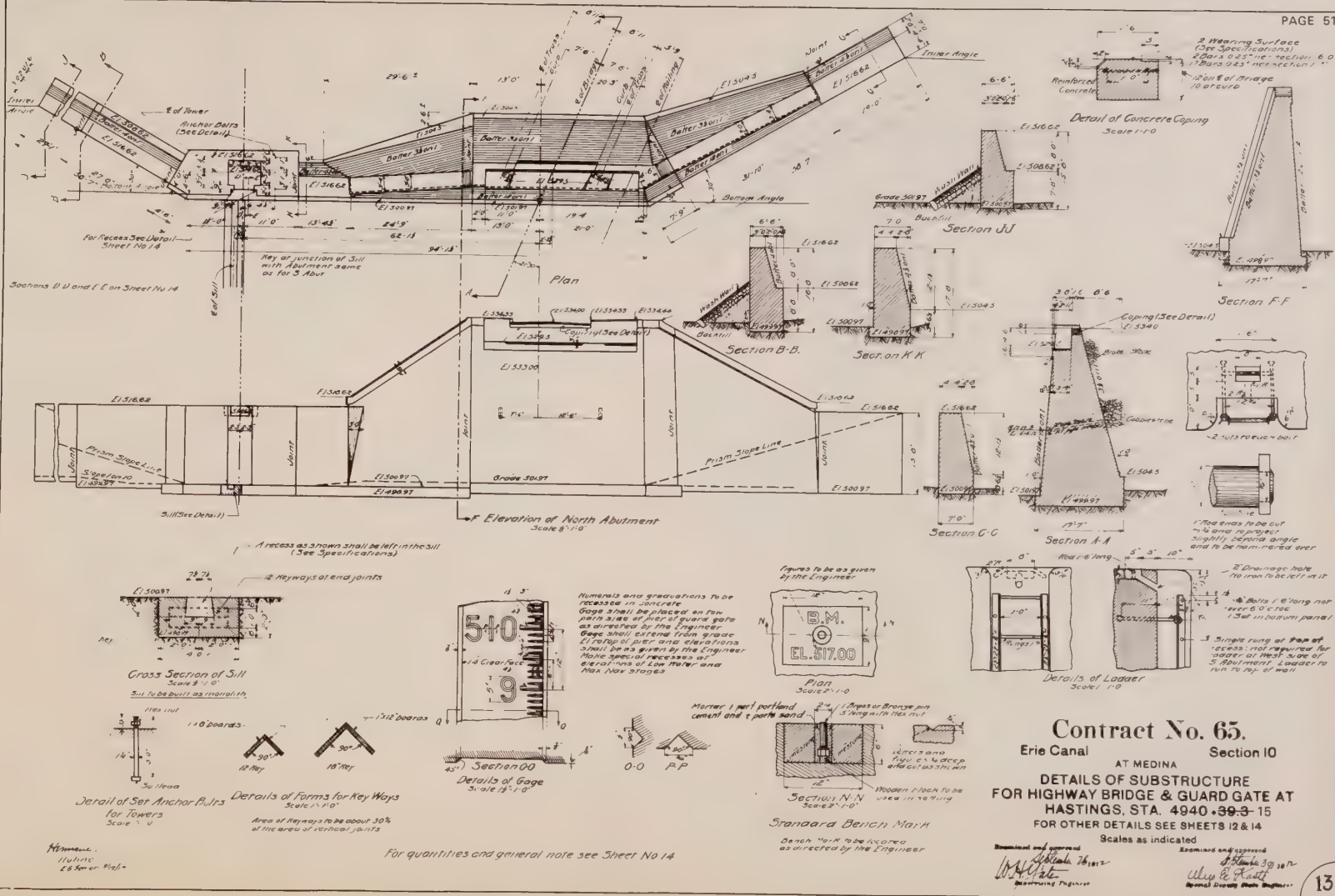
East Half Center Pier and South Abutment
Medina Guard Gate

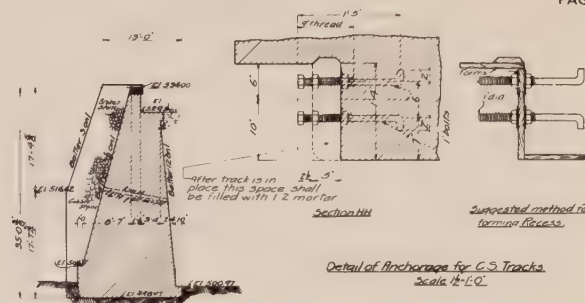
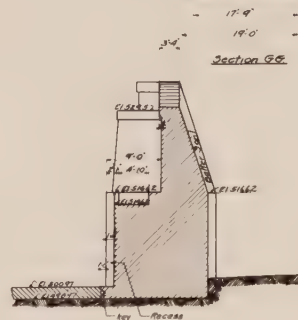
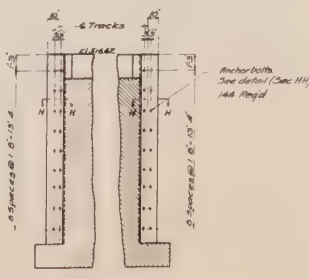
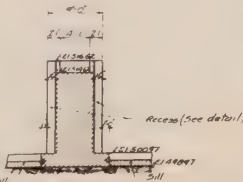
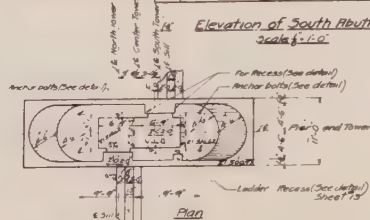
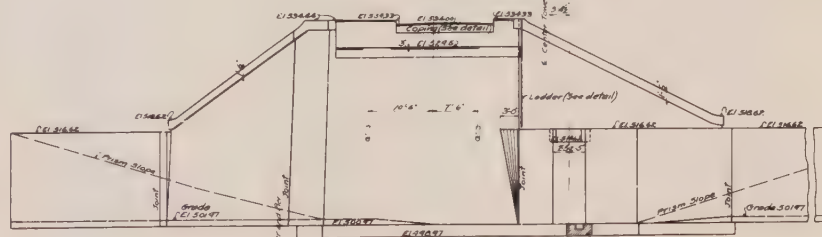
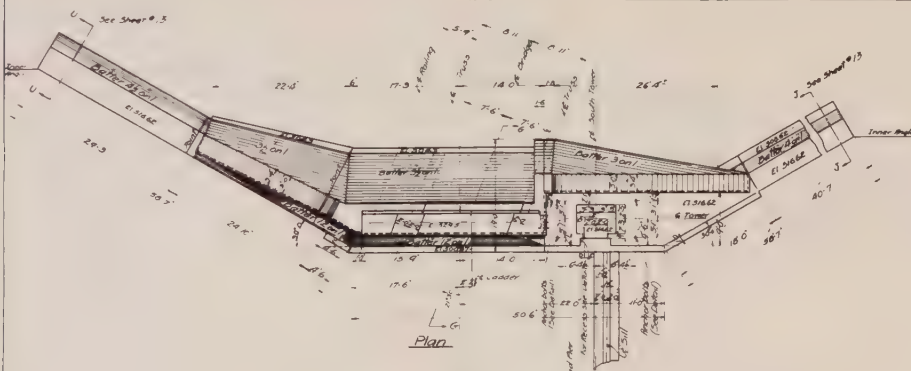


West Half Center Pier and North Abutment
Medina Guard Gate



East Half Center Pier and North Abutment
Medina Guard Gate





Reinforced Concrete shown on sheets No. 1 and 14 to be first-class concrete. All plain concrete on sheets No. 13 and 14 to be second class concrete. Exposed edges of Guard Rail Masonry rounded to radius of 3 inches. All other exposed edges rounded to a radius of 2 inches unless otherwise noted. Edges of all joints to be finished to a radius of 1/2 inch. The back wall capings to be constructed after the setting of the end floor beams are completed. The bases of structures shown are approximate only and may be ordered by the Engineer to be at any elevation and of any dimensions as may be required to give a proper foundation. Whenever concrete is to be used for abutments for Guard Rail is suspended for a period of one hour or more five keys running crosswise of the wall shall be formed on the last layer of concrete deposited. These keys shall be not less than 18 inch and 2 wide and their ends shall be 18 inch square. When placing backfill or embankment behind walls it shall be placed in horizontal layers not exceeding 15 in thickness. Broken stones of some size as used in masonry or larger shall be placed against the face of the wall in layers not exceeding 12 inches in thickness of 6 inches. This broken stone shall extend upward from the base 10 feet up to the top of fill it shall be paid for as "filling". The 6" broken stone masonry shall be included in the concrete price for 12" class concrete.

QUANTITIES

| | |
|--|--------------|
| 2nd Class Concrete | |
| North Abutment | 1373 cu yds |
| South Abutment | .1221 cu yds |
| Center Pier | 164 cu yds |
| YP Sawn Lumber (In temporary Township) | 22 M Ft BM |
| Structural Steel | 14.108 |
| Rebar Reinforcement | 55 lbs |
| Reinforced Concrete | 2 cu yds |
| Lining | 55 = " |

SEE CHANGES
PAGE 53

Contract No. 65.

Erie Canal Section 10

DETAILS OF SUBSTRUCTURE FOR
HIGHWAY BRIDGE & GUARD GATE
AT HASTINGS, STA. 4940 +39.3-15
FOR OTHER DETAILS SEE SHEETS 12 & 13

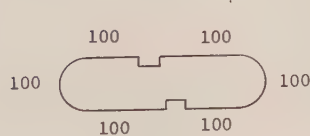
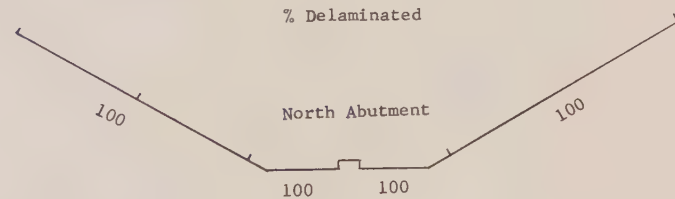
FOR OTHER DETAILS SEE SHEETS 12 & 13

Scales as indicated

Examined and approved
J. L. Humber, Jr. 1917
Superintending Engineer

Examined and approved
September 30, 19
Mrs. E. H. Hart
Grand Juror, State of Missouri

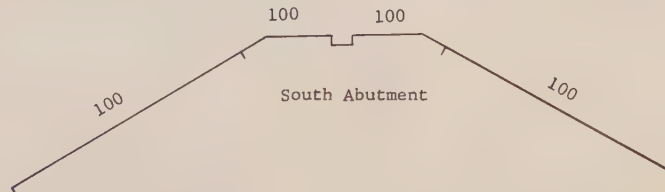
The Middleport Guard Gate is located 1.7 miles east of Middleport. On April 8, 1976, this structure was inspected, sounded for delaminations and cored.



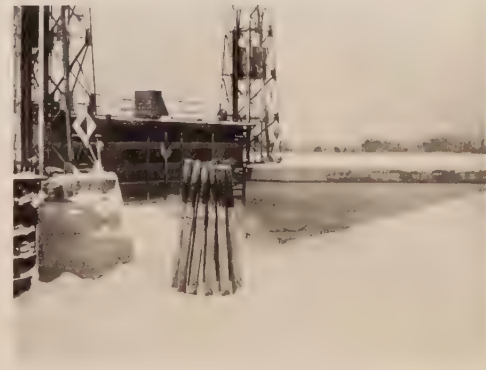
All walls sound deeply delaminated.

Medina sandstone used in all concrete.

1 foot deep scale on south abutment



Looking East
Middleport Guard Gate



East Half North Abutment and Center Pier
Middleport Guard Gate

All walls of the guard gate were found to be 100% delaminated. Coring revealed that the majority of these delaminations extended deeply into the walls. Areas of scaling up to 1 foot deep existed on the south abutment and the top 6 feet of the center of the north abutment has been recently repaired.

Core #1, taken from near the bottom of the south abutment, showed that deterioration continued beyond 2 feet into the wall.

Core #2, obtained from the center pier, revealed fractured concrete to a depth of 9 inches. Although equipment problems prevented deeper coring of the pier, deterioration in excess of 9 inches exists in most areas of the pier.



West Half North Abutment and Center Pier
Middleport Guard Gate



North side center pier
Middleport Guard Gate

This guard gate was constructed with concrete containing crushed Medina sandstone coarse aggregate. This concrete has not held up as well as the concretes containing gravel coarse aggregates used in most other structures. Deterioration was generally found to be much more extensive and deeper in those structures containing Medina sandstone as the coarse aggregate.

Conclusion

We believe that the concrete in this structure is fractured halfway or more through most walls. Although still mostly intact, complete replacement or very extensive repair is recommended for the near future.



East Half South Abutment and Center Pier
Middleport Guard Gate



East Section of South Abutment
Note Core Hole

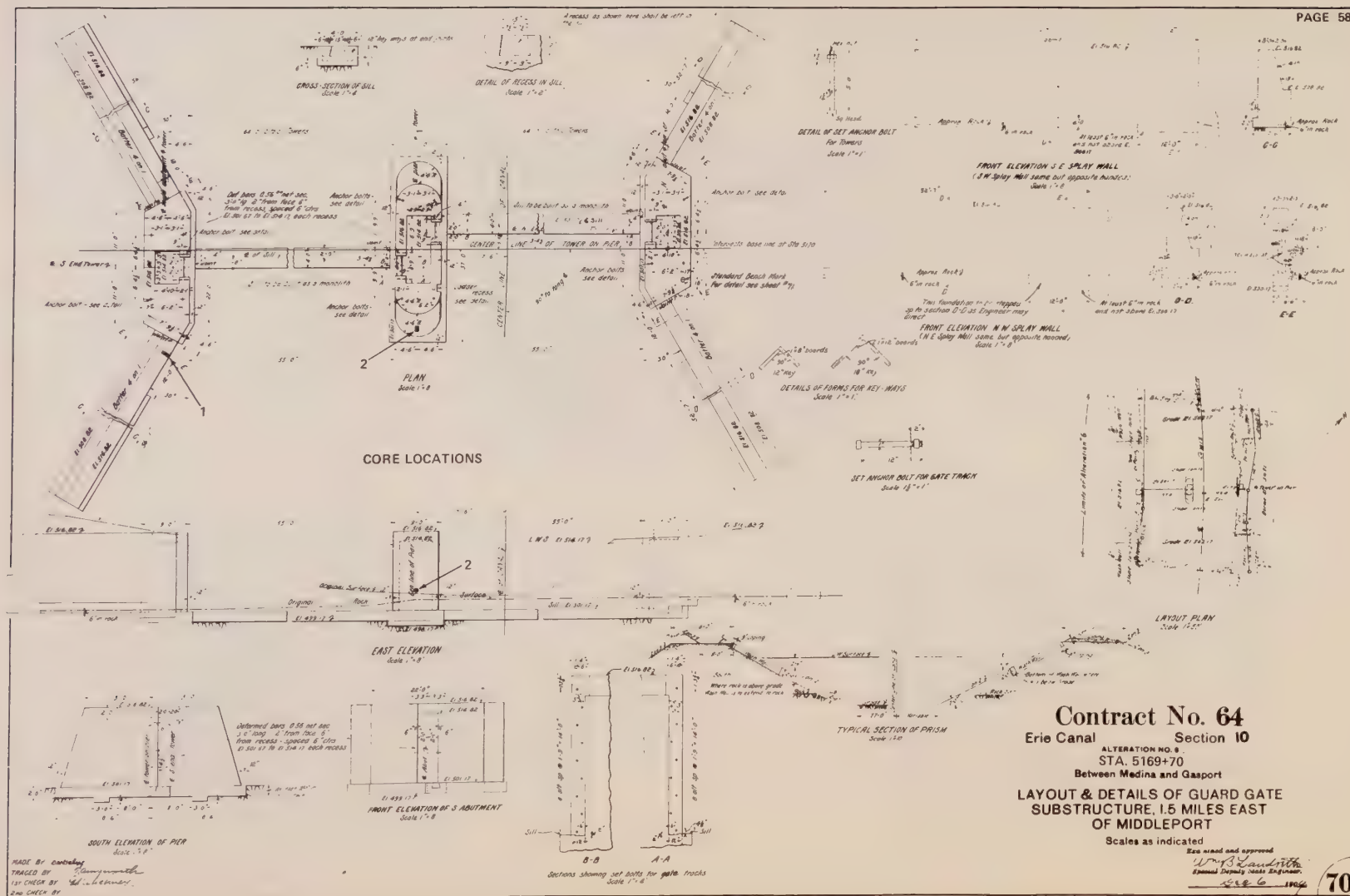


West Half South Abutment and Center Pier
Middleport Guard Gate

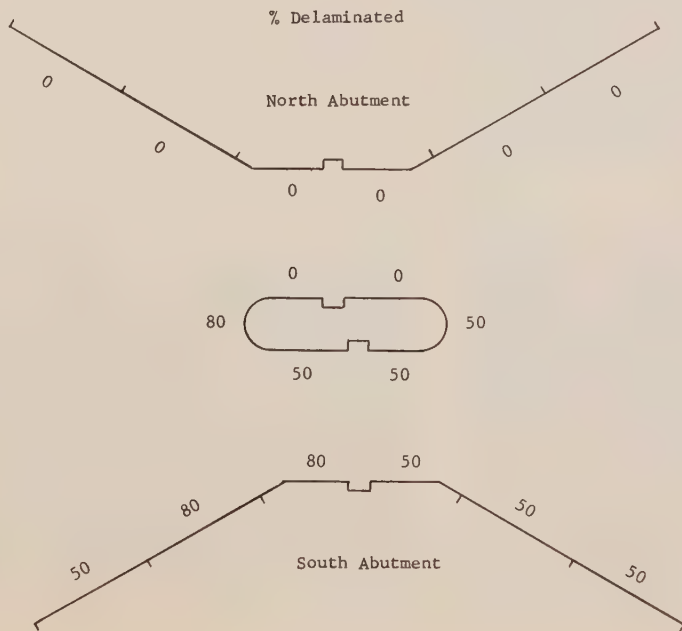


MIDDLEPORT GUARD GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|---|---------------------|---------------------------|---------------------------|------------------------|--------------------|--|
| 1 | South Abutment, East Splay Wall, 4' From Joint With Abutment, 4' Above Ground | 0 | 23" | 0 | 23" | 23" | Whole wall hollow, top 2' in very poor condition. Deeper deterioration exists. |
| 2 | Center Pier, Center of East End Nose, 4' Above Ground | 0 | 9" | 0 | 9" | 9" | All hollow, anchor pulled loose. Deeper deterioration exists. |



The Gasport Guard Gate is located 0.5 miles east of Gasport.
On April 8, 1976, this structure was inspected, sounded for delaminations and 2 cores were taken from the south abutment.



Looking West
Gasport Guard Gate



North Abutment
Gasport Guard Gate

On the north abutment, no delaminated concrete was detected, except for the usual deterioration located in the top 2-3 feet. The wall face appeared in good condition with only a few small scaled areas.

The north side of the center pier also was in good condition with no delaminations detected. However, the south side and the pier noses contained large areas of delaminated concrete. Some surface scaling has also occurred in these areas. Overall, the concrete in the pier still appeared in relatively good condition.

The south abutment contained large areas of delaminated concrete, many cracks and a few scaled areas. Cores #1 and 2, taken near the bottom of the abutment, showed that deterioration extends 13 inches and 8 inches, respectively, into the concrete. Core #1 had a compressive strength of 6125 p.s.i. even though the lower section tested contained 1 or 2 small fractures.



South Abutment
Gasport Guard Gate



East Half South Abutment
Gasport Guard Gate



West Half South Abutment
Gasport Guard Gate

The most prevalent concrete deterioration on the structure has occurred to the top 2-3 feet above the water line. Freeze-thaw action in this area has caused numerous cracks, scaling and delaminations. The south abutment was very extensively affected whereas the center pier and north abutment contained much less deterioration.

Conclusion

During sounding, the majority of deteriorated concrete was detected in the south abutment and center pier. However, cores from other structures show that tight fractures can exist in concrete that appears to be in good condition.

Although large areas of this structure appear to be in relatively good condition, future concrete repairs are recommended for the more seriously deteriorated areas. These repairs should include replacement of the concrete in the top 2-3 feet of the walls and pier. Also, all areas which contained delaminated and/or deteriorated concrete should be repaired by removing the existing concrete to an approximate depth of 8-12 inches and bonding on a new concrete surface.



North Side Center Pier
Gasport Guard Gate

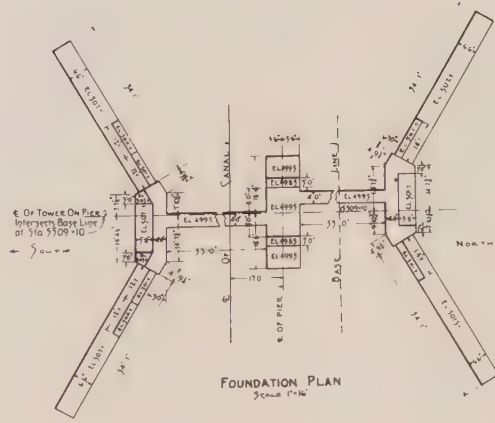


South Side Center Pier
Gasport Guard Gate



GASPORT GUARD GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|---------------------------------------|
| 1 | South Abutment, West Splay Wall, 4' From Joint With Abutment, 4' Above Ground | 0 | 13" | 0 | 18" | 18" | Near edge of hollow sounding area. |
| 2 | South Abutment, 6' West of Gate, 3' Above Ground | 0 | 8" | 0 | 12" | 12" | Near edge of hollow sounding area. |

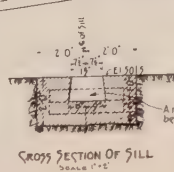
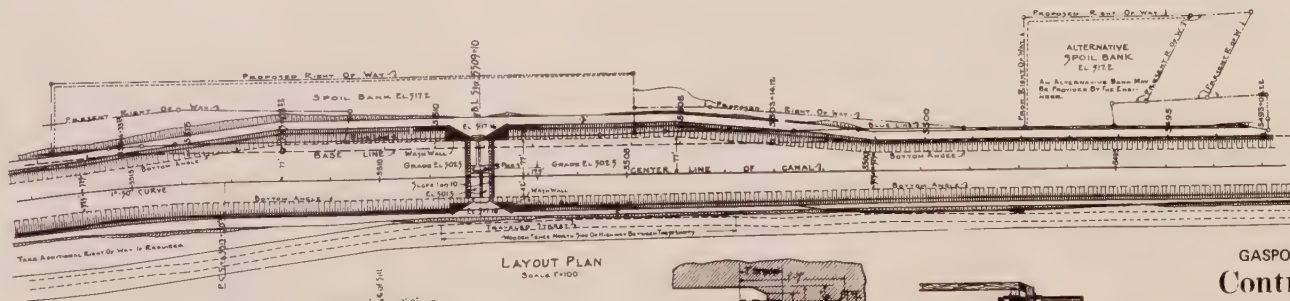


GENERAL NOTES FOR GUARD GATE

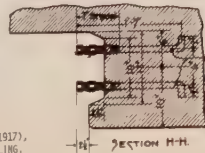
GENERAL NOTES: 1. All concrete shown on this plan to be 2nd Class Concrete. Round all exposed edges of concrete to a radius of 3" unless otherwise shown. Round edges of joints to radius of 3". The bases of structures shown on this plan are approximate only and may be ordered by the Engineer to be at any elevations or of any dimensions necessary to give a proper foundation.

Whenever concreting on pier or abutments is to be suspended for a period of one hour or more, five keys running crosswise of the wall shall be formed above the last layer of concrete in each structure. These keys shall be not less than 12" high and 2" wide and their ends shall be 18" from face of the finished concrete.

Wing walls to be bonded with longitudinal keys according to the specifications.
For details of temporary timber township see 5h*71 Dimensioning
to be altered by the Engineer to suit local conditions
For details of gage see 5h*71



SEE CONTRACT NO. 163, SHEET 5 (JULY, 1917),
STRAINS AND BESSIE FILLING



DETAIL FOR SETTING FOR C.S. TRACK.



GASPORT GUARD GATE
Contract No. 64.

ALTERNATION NO 10

Erie Canal Section 10
LAYOUT & DETAILS OF GUARD GATE
SUBSTRUCTURE, STA. 5509+10

Scales as indicated 5508+00

Examined and approved

July 10, 1911.
 Alex. E. Keath
 Special Deputy State Engineer.

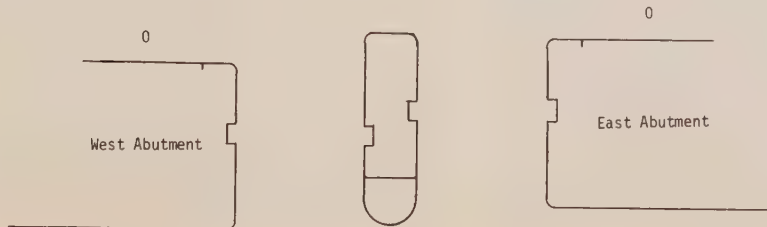
MADE BY James L. Adams May 1911
 TRACED BY James L. Adams June 1911
 1ST CHECK BY A. M. Bailey 8-11
 2ND CHECK BY James L. Adams 7-11

The Pendleton Guard Gate is located 4.5 miles southwest of Lockport in the Township of Pendleton. On April 1, 1976, this structure was inspected and sounded for delaminations. As no large areas of visual deterioration were noted on a previous inspection, and considering the difficulty of getting equipment to the site, no cores were taken from this structure.

Since there are no other gates between this one and the Niagara River, the water level on the south side of the gate always remains at full depth. Due to periodic high water levels on the river, this guard gate is over 12 feet higher than the other guard gates. Whereas the other guard gates generally face east and west, this structure faces north and south.

Water too deep to
sound center pier.

All north side concrete
looks in good condition



Most south side concrete above water
looks scaled, cracked and delaminated.



Looking South
Pendleton Guard Gate



West Side Center Pier and East Abutment
Pendleton Guard Gate

All concrete on the north side of the gate appeared in very good condition. No delaminations were detected on the abutment sidewalls and there were practically no signs of any cracks or scaling on the abutments or center pier. Even the concrete in the top 2 feet was in good condition with no cracks or delaminations. Due to deep water, it was not possible to sound the center pier or abutment faces.

On the south side, above the water line, practically all concrete appeared in fair condition. Although presently intact, the 9 foot high concrete nose on the center pier was cracked, delaminated, and the surface scaled. Both abutments were in better condition, but cracks, scaling and delaminations were widespread. Concrete below

the water line is impossible to visually inspect due to muddy water. However, as the north side concrete was still in good condition and the south side is always under water, we believe this concrete should still be in good condition.

CONCLUSION

The concrete in this structure is still in relatively good condition and no immediate repairs are recommended. Future repairs should include removal and replacement of 8 inches or more of concrete on the wall faces and tops, and replacement of the 9 foot high pier nose section. The majority of these repairs will be required only on the south side of the gate.



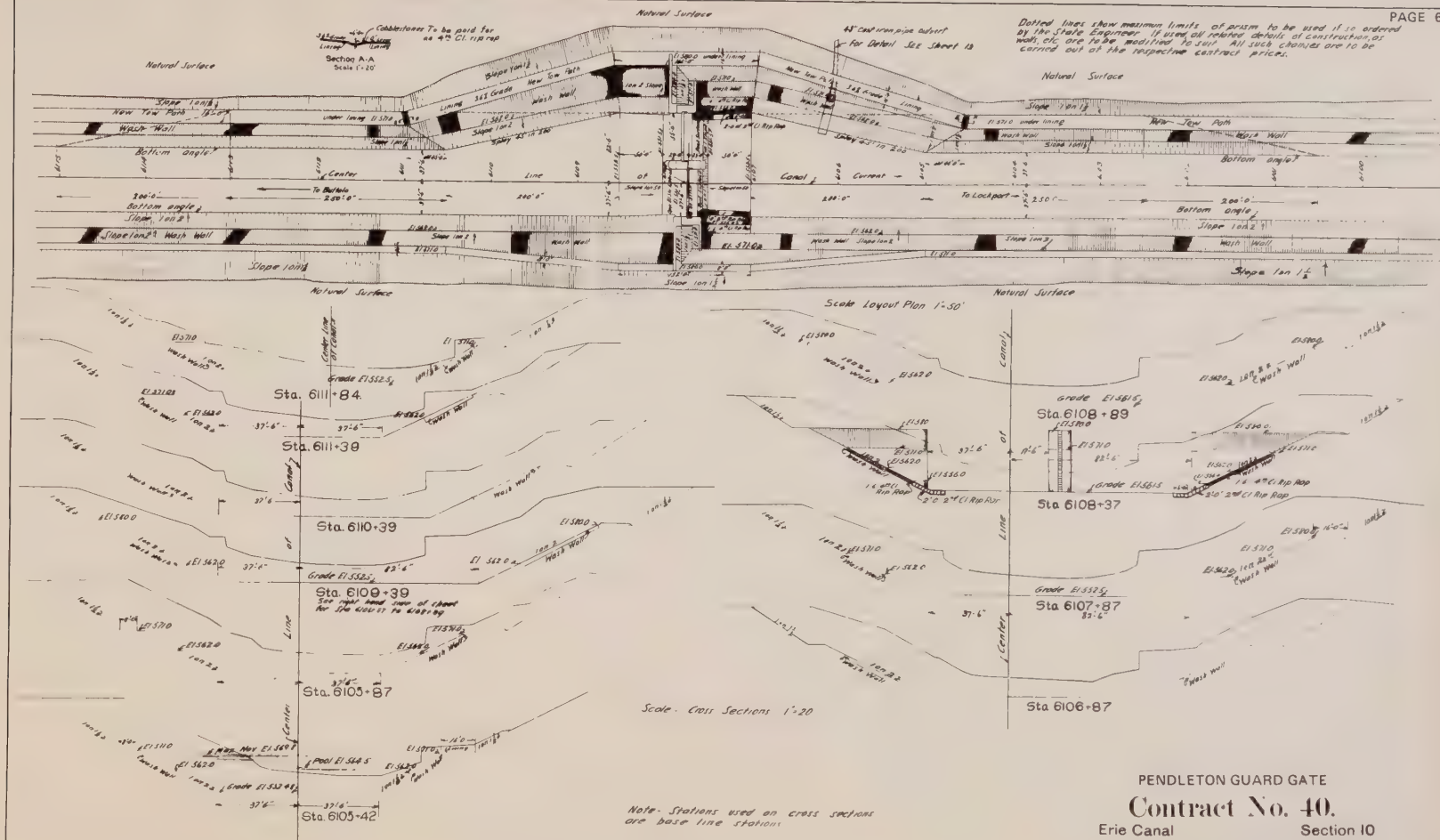
East Side Center Pier and West Abutment
Pendleton Guard Gate



West Side Center Pier and East Abutment
Pendleton Guard Gate



East Side Center Pier and West Abutment
Pendleton Guard Gate



Made By R. S. Phlegm Aug 10
Traced By J. H. North
1st Checked By J. C. (unclear) Aug 10
2nd Checked By R. S. Phlegm

PENDLETON GUARD GATE

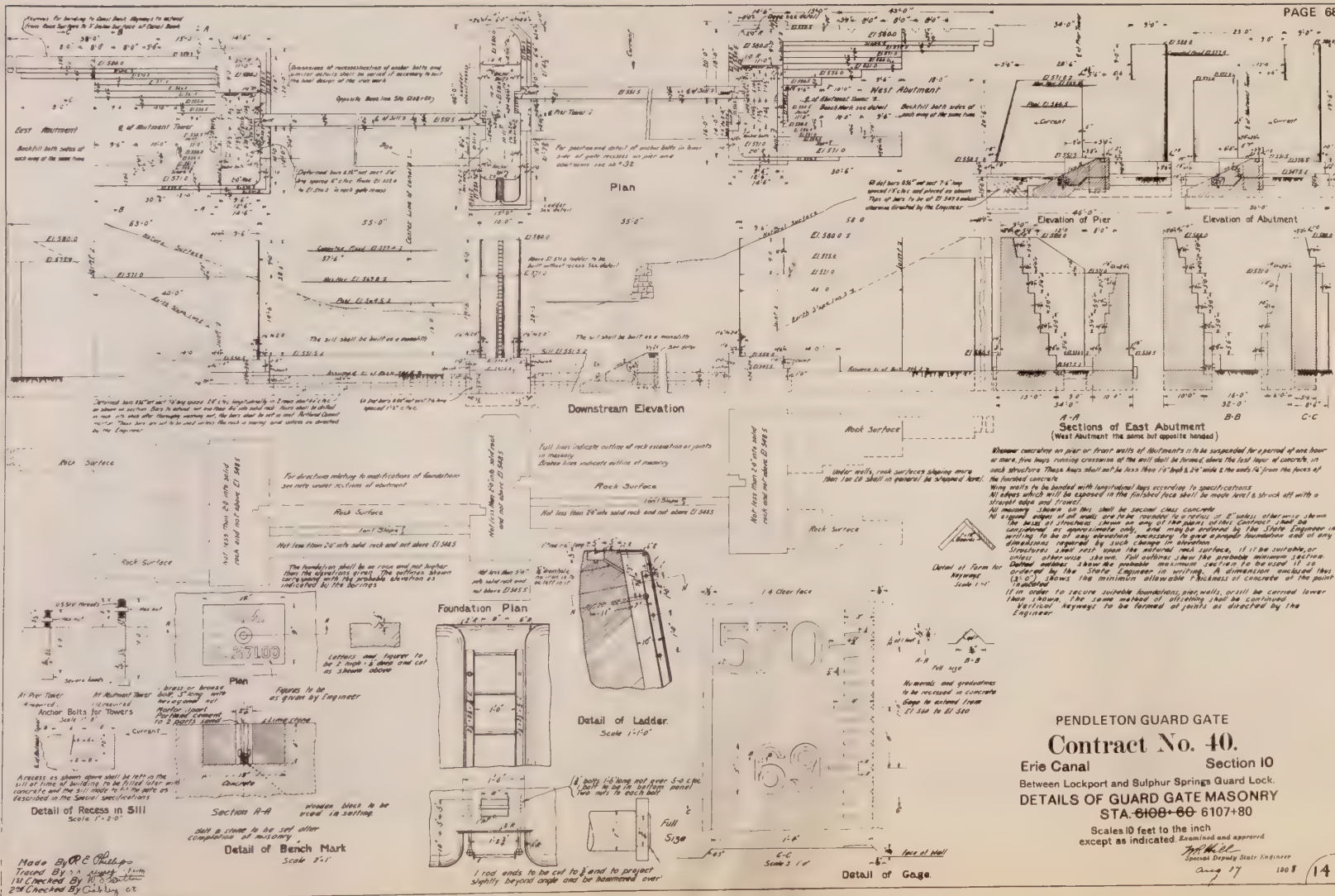
Contract No. 40.

Erie Canal Section 10
Between Lockport and Sulphur Springs Guard Lock
LOCATION PLAN & SECTIONS OF
GUARD GATE STA. 6108+60 6107+80

Scales as indicated

Examined and approved
J. P. McCall
Special Deputy State Engineer

Aug 17 1902 15



Between each pair of guard gates or guard gate type structures, such as locks and guard locks, there are 1 to 3 water level control structures called waste gates or sluiceways. These are always constructed parallel with the embankment and usually have a small dam or weir attached to one side. Water passing through the waste gate or over the weir feeds into a natural stream capable of handling large flows.

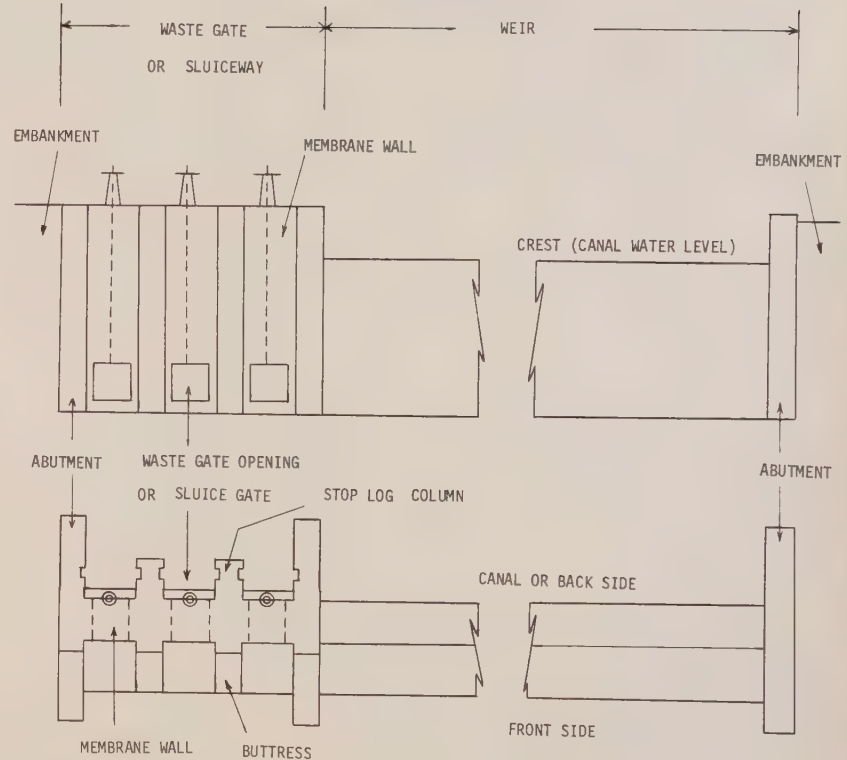
Canal water flows from the Niagara River at Tonawanda to the Locks at Lockport. From Lockport the water flows eastward across the "60 Mile Level", where the majority of the waste gates are located, to the Genesee River at Rochester. The Genesee River normally feeds the canal to the east except during periods of low flow. During this period, water fed by the Niagara River supplements the water supply to the east of Rochester.

The major function of the waste gates is to drain that section of the canal between two closed guard gates. This draining could result from an emergency, such as an embankment or culvert leak, or at the end of the season when the entire canal is drained.

The waste gates are also used to regulate the flow and level of the canal by discharging a controlled amount of water. This water is also used downstream to generate power at Medina and Rochester and by industry at Lockport. A new function of the waste gates has been to increase the flow rate of certain streams. This is being done in an attempt to get fish from Lake Ontario to come upstream to spawn.

The only function of a weir is to act as a safety valve and release large quantities of high water quickly. The crest of the weir is at normal canal water elevation and, if the water rises, it passes over the top of the weir. This

TYPICAL STRUCTURE



prevents water from overflowing and washing out an embankment section. The crest elevation of nearly all the weirs has been raised by attaching angle irons or boards to the crest. This reduces water loss from waves and allows the canal water level to rise a few inches.

Most of the structures have a weir attached to one or both sides of the waste gate. Two structures (Albion and Brockville) have the weir and waste gate combined into one section. At Albion, there is also a weir on one side in addition to the one over the sluiceway.

In the Spring of 1976, the 13 waste gates and weirs between Lockport and Rochester, and the one east of Rochester at Fairport, were inspected. Cores were obtained from all except the ones at Greece (recently rebuilt) and Fairport (very good condition).

As shown in the original Barge Canal plans, two structures utilize sections of the enlarged Erie Canal waste gates and weirs. The Albion Waste Gate and Weir is a stone masonry structure faced and capped with concrete, and the Lockport Waste Gate has stone block columns and walls encased in concrete.

Contract 163 contained plans for filling notches in 10 of the 13 weirs between Rochester and Lockport. These 2 foot deep notches maintained the water level of the enlarged Erie Canal until the new Barge Canal was completed. However, no bids were received on Contract 163. Therefore, Department Forces filled the notches with concrete in the Spring of 1918 to bring the water up to the present level. These notches are not shown on any of the waste gate and weir plans.

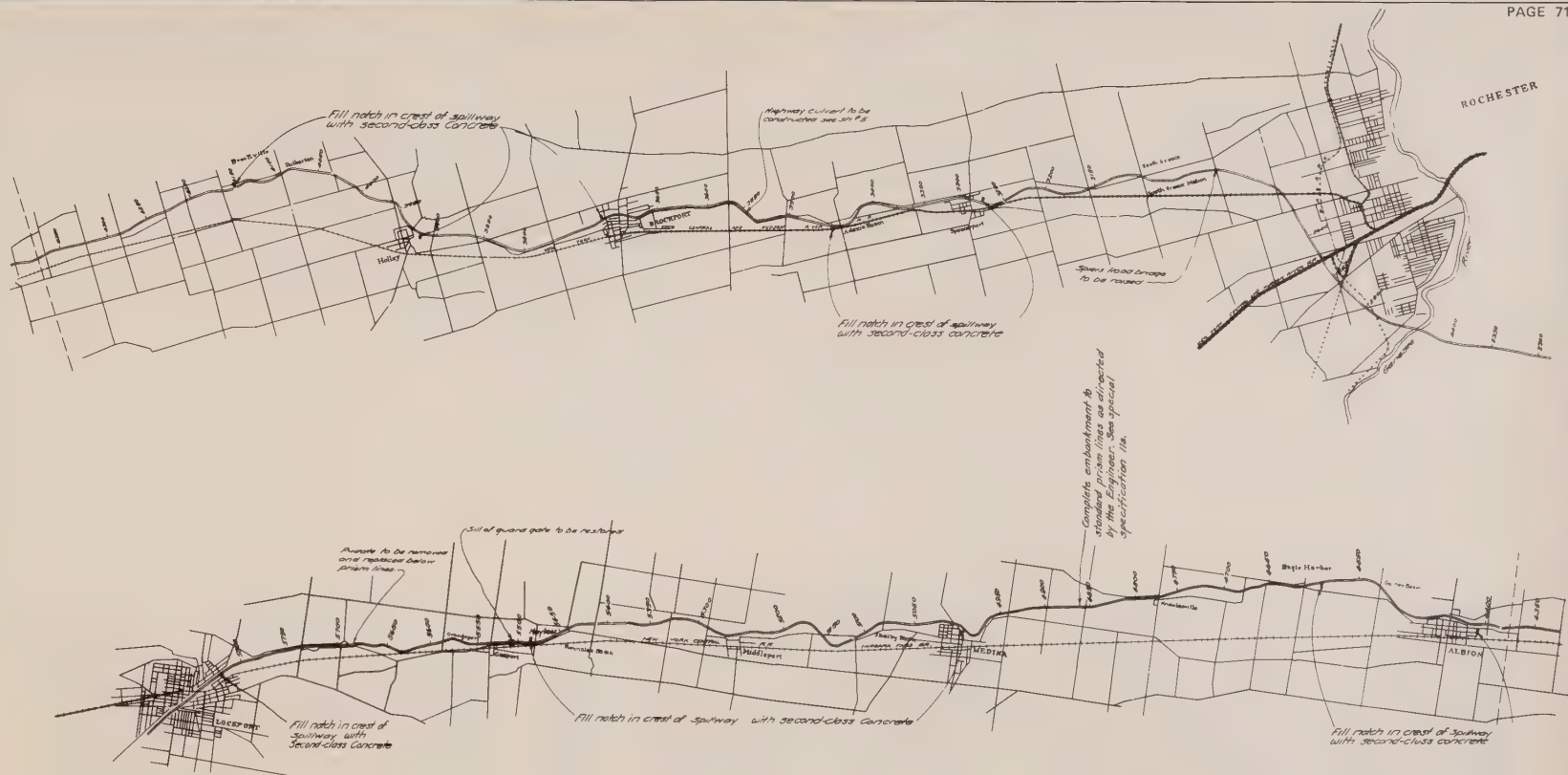
During our inspections, most of these notches were noticeable by the construction joints. In some, the concrete used to fill the notches has deteriorated considerably more than the adjacent original concrete. In 1976, the notch area at the Lockport Weir was removed and rebuilt. Instead of the notch being straight across as shown in Contract 163, the notch was stepped to form a keyway.

Five of the waste gates and weirs (Fairport, Greece, Brockport, Brockville, and Gasport) are either in good condition or have been recently rebuilt. The other 9 all need various repairs.

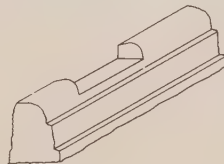
Vegetation in the form of grass and brush was observed growing from the crest of weirs and in cracks of the waste gates, especially Medina and Adams Basin. This is not only unsightly, but plant roots accelerate concrete deterioration.

Two of the structures (Adams Basin and Eagle Harbor) were almost completely covered with shotcrete and others were partially covered. All the shotcrete was loose since little or no surface preparation was made to the existing concrete. This cosmetic repair hindered the evaluation of the structures.

Problems were also encountered in operating the waste gate valve machinery at Albion, Medina, Middleport, and Lockport. Some of these gate valves did not function properly and some could not be operated at all.



| Location | Length of Notch | Approximate Concrete |
|--------------|-----------------|----------------------|
| Spencerport | 10.0' | 6 C.Y. |
| Adams Basin | 23.5' | 17 C.Y. |
| Brookport | 10.0' | 6 C.Y. |
| Holley | 25.0' | 11 C.Y. |
| Brookville | 13.5' | 4 C.Y. |
| Albion | 24.0' | 10 C.Y. |
| Engle Harbor | 25.0' | 9 C.Y. |
| Medina | 60.0' | 36 C.Y. |
| Mayhew | 14.0' | 4 C.Y. |
| Lockport | 42.8' | 20 C.Y. |



VIEW SHOWING TYPICAL CREST & NOTCH

FILL NOTCH IN WEIRS
Contract No. 163
 Erie Canal Sections 9 & 10
MAP SHOWING LOCATION OF WORK TO BE DONE
 Scale: 1 inch = 1 Mile

Examined and approved

July 27 1917
 J. C. McNamee
 Division Engineer.

Examined and approved

July 27 1917
 J. C. McNamee
 Special Deputy State Engineer

Made by
 Thomas J. J. J.
 1st Check by J. C. McNamee
 2nd Check by J. C. McNamee

The Fairport Waste Gate and Weir is located in Fairport on the north side of the canal. In the center of the structure are 4 sluice gate openings and 20 foot long weirs about both ends of the waste gate.

The membrane wall and buttresses of the waste gate appeared in very good condition with only a few small cracks and no delaminations or scaling. Deep water prevented sounding the lower wall surfaces.

Both weirs also appeared in good condition. A few cracks were denoted by efflorescence and small isolated spots of scaling existed. The only problem seen on the structure was that the top 6 inches of the west weir crest was delaminated. The east weir crest was in much better condition with only a few small scaled areas. A number of cracks existed on the abutments and some scaling and delamination has occurred on top of the west abutment.



North Side
Fairport Waste Gate



West Abutment
Fairport Weir



East Abutment and East Half of Weir
Fairport Weir

On all the other waste gate and weir structures, the towpath bridge is located in front of the weir. At Fairport, the towpath bridge is located behind the weir and supported by 3 piers just above the canal water level. This 4 span, concrete T-beam bridge appeared in generally good condition, but a few cracks were noted on the piers and abutments. Also, there were 2 or 3 areas where the concrete had spalled off the bottom of the beams and exposed the reinforcing steel.

Due to the generally good condition of this waste gate and weir structure, and the deep water on both sides, no cores were taken and the concrete was not completely sounded for delaminations.

CONCLUSION

This structure is still in good condition and only isolated repairs are presently recommended.



West Half, Note crack along crest
Fairport Weir



Looking West
Fairport Weir



Canal Side, Looking North
Fairport Weir

GREECE WEIR AND WASTE GATE

The Greece Waste Gate and Weir is located in South Greece about 1/2 mile west of Long Pond Road on the north side of the canal. Originally, the waste gate had 4 openings and extended eastward for 100 feet. As seen from the rear, this structure appeared to have been seriously deteriorated.

Land development adjacent to the downstream drainage channel prevented the simultaneous opening of all four gates. Therefore, in the middle 1960's, this structure was made inoperative by constructing an earthen embankment in front of the weir. A new waste gate with a single opening was then constructed by Canal Maintenance Personnel at the east end of the inoperative weir. The gate and other necessary hardware were obtained from the Brockport Waste Gate where 1 of 3 gate openings was permanently sealed.

Canal water passes through the new waste gate into a concrete well covered with a steel grate and then goes through a small culvert under the embankment.

CONCLUSION

This new waste gate was in excellent condition and no work is recommended.



Looking West, Note new waste gate in foreground.
Greece Weir



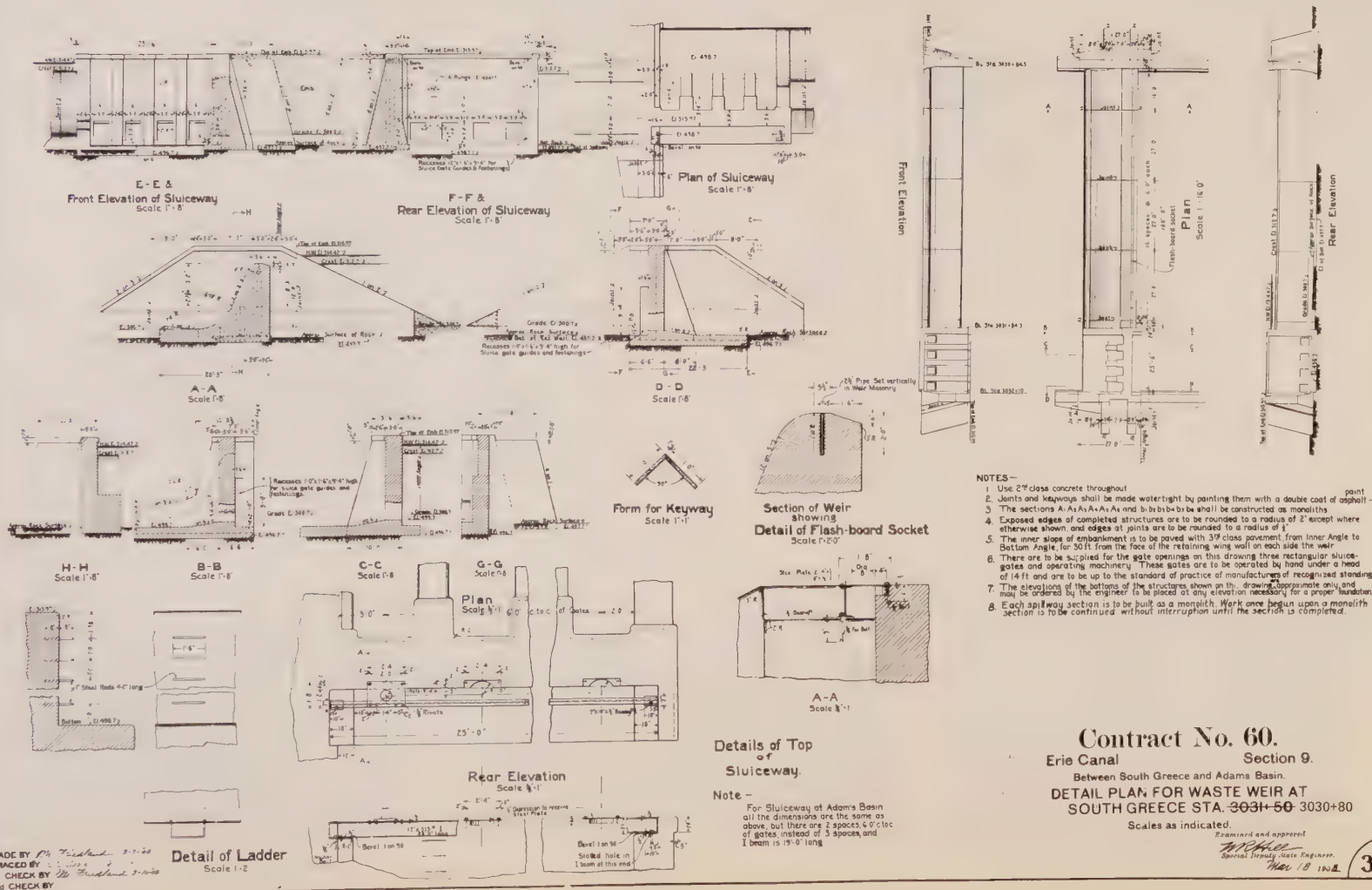
Looking East, Note road in front of weir.
Greece Weir



Canal Side, Looking East
Greece Weir



Canal Side, Looking West
Greece Weir



The Spencerport Waste Gate and Weir is located 1/4 mile east of Spencerport on the north side of the canal. A steel grate bridge carries the tow path over the waste gate and weir.

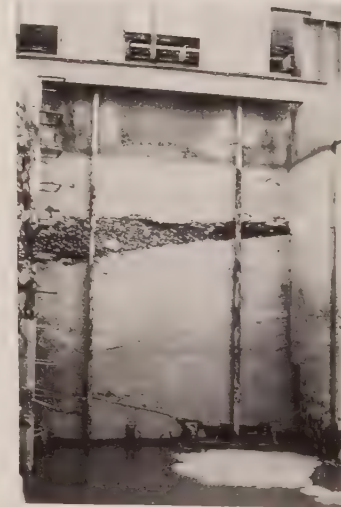
The 8½ foot wide waste gate or sluiceway has two openings. A small 5 foot high center buttress between the openings supports the 18 inch thick, 16 foot high, membrane wall. As shown on the plans, the main reinforcement for this thin wall is a series of 5/8 inch square reinforcing rods embedded in the north face of the membrane wall.

The bottom 10 feet of the membrane wall was heavily effloresced on the north or front side and some seepage of canal water through this section was evident. A cold joint ran horizontally across the wall 5 to 6 feet from the bottom. Approximately 70% of the wall was effloresced and 50% sounded delaminated. The top section of the wall appeared and sounded in good condition.

Cores #1 and 2, taken from the front of the gate, showed deterioration to a depth greater than 1 foot. Core #3, taken from the back or canal side of the gate, showed deterioration to a 6 inch depth. Although the lower sections of Cores #2 and 3 contained 1 or 2 small fractures, they had compressive strengths of 3225 and 5420 p.s.i., respectively.



North Side, Core Hole #1 (right) and #2 (left), Note joints across wall.
Spencerport Waste Gate

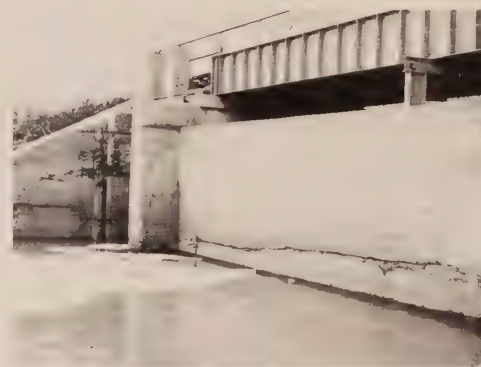


Canal or South Side, Note cold joints across wall. Spencerport Waste Gate

In the middle 1960's State Maintenance Forces rebuilt the upper half of the weir and reconstructed the tow path bridge. Core #5, taken from a non-reconstructed area on the back side of the weir, contained deterioration 6 inches deep. Core #6, obtained from a reconstructed area on the front of the weir, showed no deterioration. Core #6 was taken through a vertical crack which extends the full length of the core. No water was leaking through this crack, but canal water was rising out of a small crack at the toe of the weir. Less than 5% of the weir exhibited any form of deterioration. Although it contained 1 or 2 small fractures, the middle section of Core #5 had a compressive strength of 6265 p.s.i.



North Side
Spencerport Weir



South Side, Looking West, Note repairs to
top half of weir. Spencerport Weir



South Side, Looking East, Note repairs to
top of weir and deteriorated east abutment.
Spencerport Weir

The west abutment exhibited large cracks on approximately 20% of its area. The majority of these cracks probably extend through the wall. Small cracks and efflorescence covered approximately 60% of the abutment surface and delaminations were detected on 40% of its surface. The south end of the west abutment (normally under water on canal side) had small areas of scaling and cracks along the top, but few delaminations were detected on the front surface.

The north half of the east abutment had cracks and efflorescence on approximately 90% of its surface and scaling or delaminations on 60% of its surface. Core #7, taken from this wall on April 26, 1977, was located in a hollow sounding area with 1 foot deep scaled areas above and below the core hole. The core showed that deterioration extends over 2½ feet into the abutment. The south half of the east

abutment (normally under water on canal side) had two long, horizontal, deep scale areas. The remainder of the surface contained few delaminations, but Core #4 showed deterioration to a depth of 5 inches.

The surface of the tow path bridge pier was 60% covered with cracks and efflorescence, 30% scaled and 25% delaminated.

CONCLUSION

The depth of concrete deterioration in the waste gate membrane wall, although reinforced, indicates that this part of the water control structure should be rebuilt now. Both abutments and the bridge pier also need to be repaired or replaced. The weir is in good condition and no additional work is anticipated for this part of the structure.



East Abutment
Spencerport Weir



Looking West, East Side of Pier
and Wingwall of West Abutment.
Spencerport Waste Gate and Weir

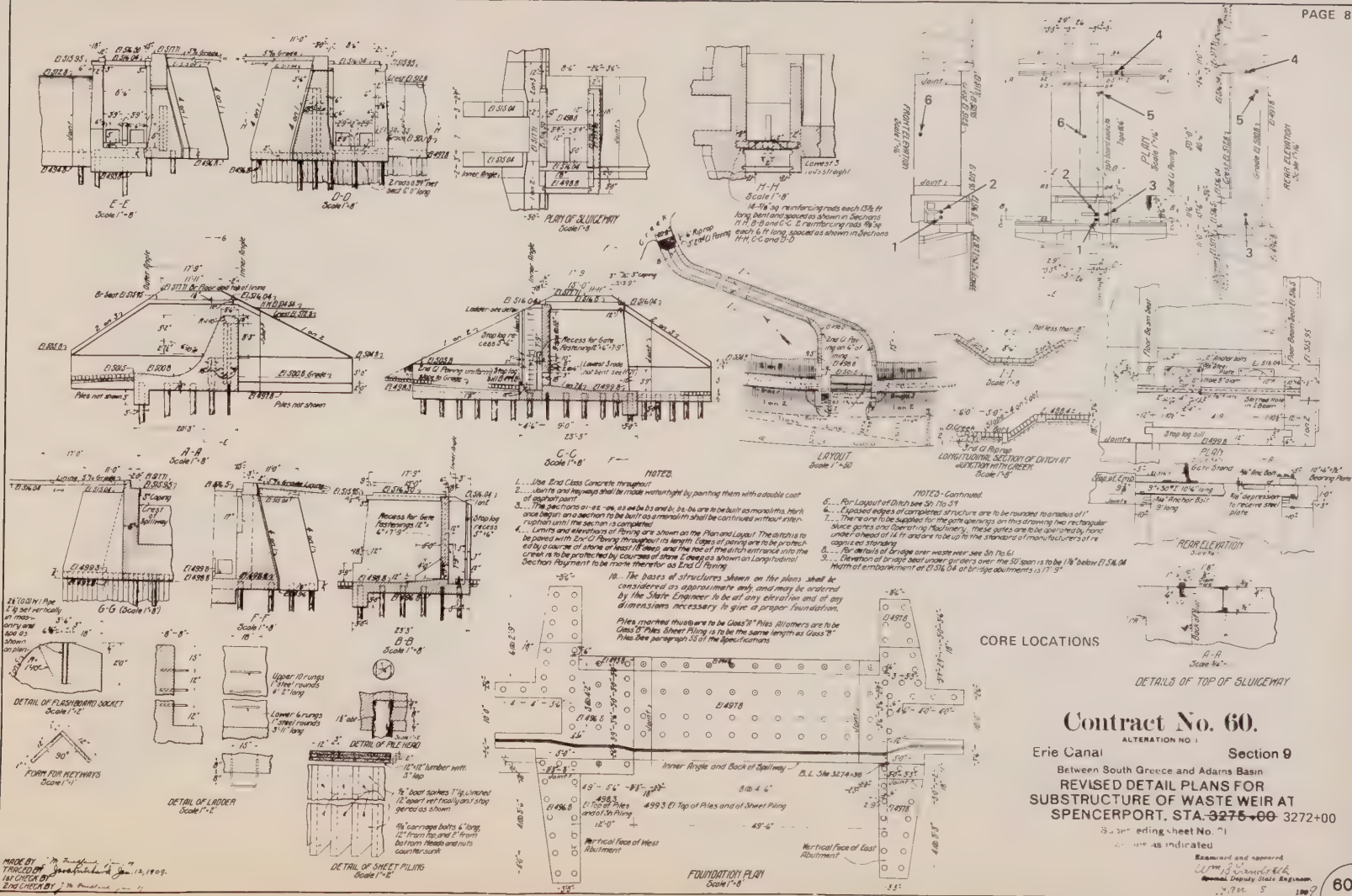


West Abutment
Spencerport Waste Gate



SPENCERPORT WEIR AND WASTE GATE

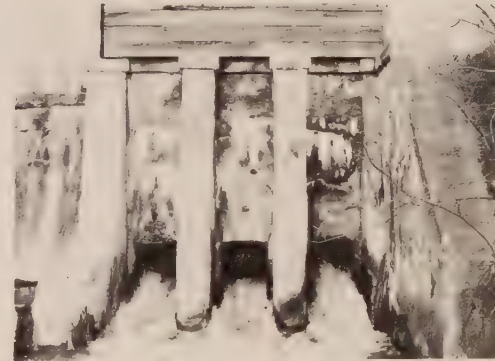
| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|--|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|---|
| 1 | Waste Gate, North Side, 2' From West Abutment, 6' Above Floor | 0 | 12½" | 0 | 12½" | 12½" | Cored through cold joint. Deeper deterioration exists. |
| 2 | Waste Gate, North Side, Center of Wall Panel, 6' Above Floor | 0 | 12" | 0 | 13½" | 13½" | Taken above cold joint, heavy efflorescence. |
| 3 | Waste Gate, South (Canal) Side, Center of Wall Panel, 7' From Bottom | 0 | 6" | At 5" | 13" | 13" | |
| 4 | East Abutment, Canal Side, 5' From Weir, 4' From Bottom | 0 | 5" | At 9" | 21" | 21" | |
| 5 | Weir, South (Canal) Side, 6' From East Abutment, 3' From Bottom | 0 | 6" | At 10" | 12" | 12" | |
| 6 | Weir, North Side, Center of Weir, 2' From Bottom | 0 | 0 | 0 | 12" | 12" | Cored through vertical crack. |
| 7 | Center Of East Abutment North of Weir, 4' From Bottom | 0 | 32½" | 0 | 32½" | 32½" | Area hollow and scaled up to 1" deep above and below core hole. Deeper deterioration exists. |



The Adams Basin Waste Gate and Weir is located just west of Adams Basin on the south side of the canal. Most of the waste gate and weir has been covered with shotcrete on both sides. This shotcrete was loosely bonded to the old surface and about half has fallen off the weir.

The waste gate has three sluice gate openings and two buttresses to reinforce the membrane wall. The shotcrete coating made it difficult to sound the structure and detect delaminations. Sounding of areas not covered with shotcrete revealed some delaminations. Cores #1 and #3 were taken in areas of the membrane wall which represent typical conditions. These cores showed deterioration to 10 and 7 inches, respectively. The lower section of Core #1 had a compressive strength of 4030 p.s.i. even though it contained 1 or 2 small fractures.

Core #2, taken in a typical area of a buttress, showed deterioration existed to a depth of 4 inches. However, close examination of the sloping buttress faces indicated that deterioration existed here to an approximate depth of 12 inches.



South Side, Note Core Holes #1 and 3
Adams Basin Waste Gate



Canal Side
Adams Basin Waste Gate

Approximately half of the shotcrete placed on the front of the weir has fallen off and most of the remaining shotcrete was only loosely bonded. The exposed concrete surface was lightly scaled with about 25% of the concrete being delaminated. Water seeping from beneath the shotcrete was most likely coming from the crest of the weir where the top 2 feet appeared to be deteriorated. Scattered vegetation was growing along the crest of the weir. Core #4, taken from the front of the weir, indicated deterioration to 8 inches in this delaminated area. The lower section of Core #4 had a compressive strength of 3640 p.s.i.

The east abutment, not covered with shotcrete, was approximately 75% cracked and exhibited efflorescence. Delaminated areas existed on over half of the surface. At one time, the west abutment was completely covered with shotcrete, but 25% has now fallen off. The exposed concrete sounded delaminated, and 50% of this exposed surface was cracked and effloresced.



South Side, Note missing shotcrete and vegetation along crest.

Adams Basin Weir



Canal Side, Note repairs along crest
Adams Basin Weir

Conclusions

Since the shotcrete placed on the existing concrete was only loosely bonded, and in some areas had fallen off, we believe that this cosmetic method of repair has little merit. In all cases, it has hindered the evaluation of the structures.

Cores taken from this structure indicate deterioration exists from 4 to 10 inches in depth. We believe that similar deterioration exists in the abutment walls and that the weir crest needs replacement. Repair procedures would include chipping deteriorated concrete until sound concrete is reached and then encasing the structure in new concrete to prevent further deterioration.



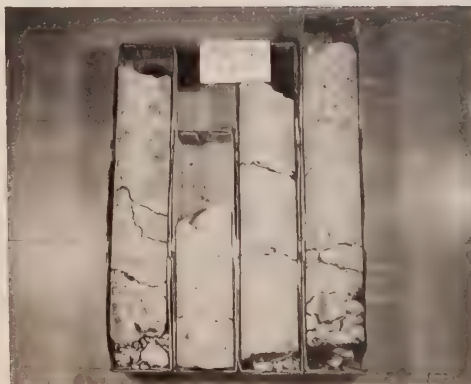
North or Canal Side
Note repairs along top of weir.
Adams Basin Weir

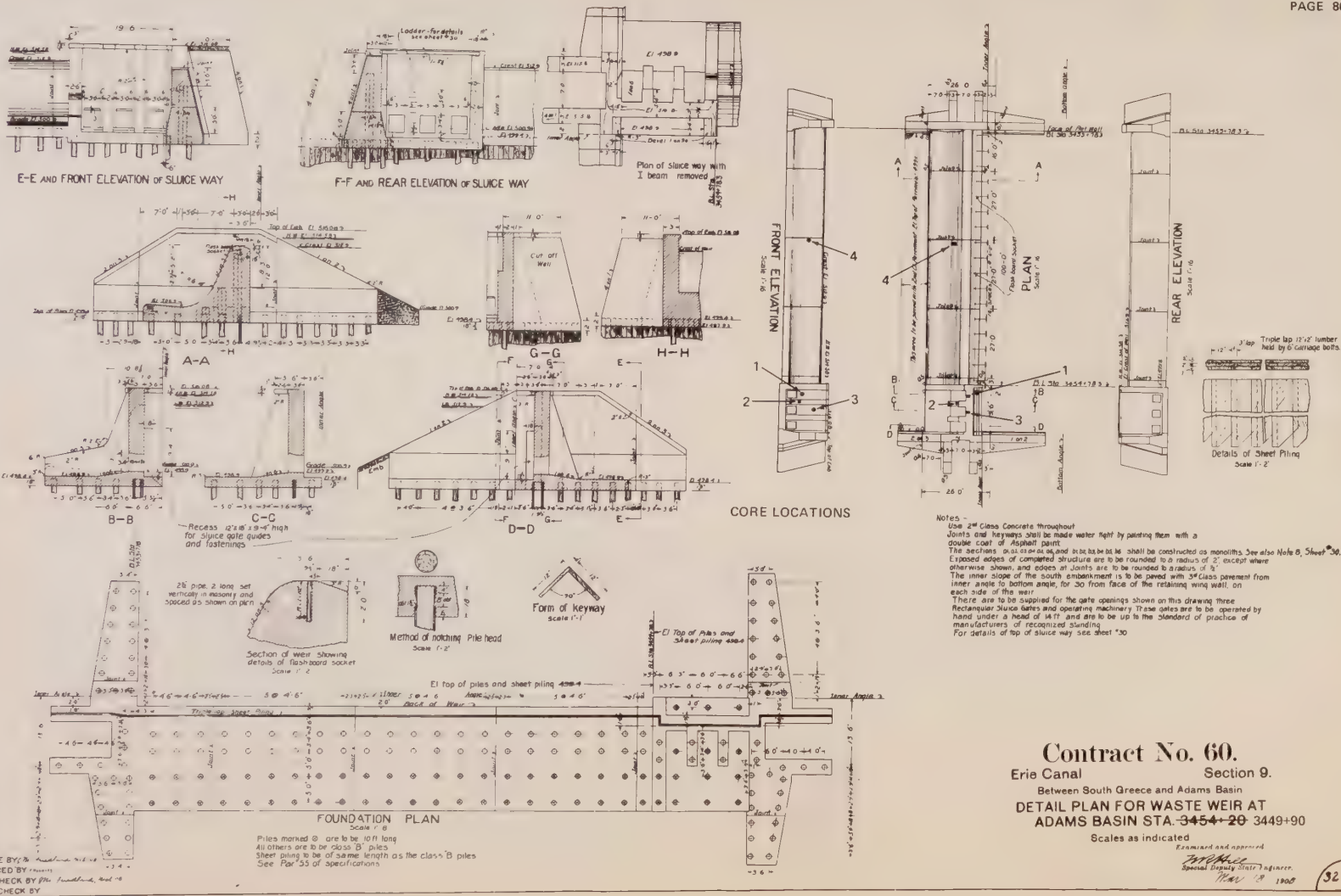


East Abutment
Adams Basin Waste Gate

ADAMS BASIN WEIR AND WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|--|---------------------|---------------------------|---------------------------|------------------------|--------------------|--|
| 1 | Waste Gate, South Side, Center of West Panel, 5½' Above Floor | 0 | 10" | 0 | 21" | 21" | Entire area shotcreted. |
| 2 | Waste Gate, South Side, West Side of West Buttress, 3' From Panel Wall, 4½' Above Floor | 0 | 4" | 0 | 11½" | 11½" | Entire area shotcreted. |
| 3 | Waste Gate, South Side, Center of Middle Panel, 8' Above Floor | 0 | 7" | At 13" | 19½" | 19½" | Entire area shotcreted. |
| 4 | Weir, South Side, 55' From East End, 6' Above Floor | 1" | 8" | At 14" | 21" | 22" | Entire area shotcreted; 50% has fallen off. |





Contract No. 60.

Erie Canal Section 9.

Between South Greece and Adams Basin

DETAIL PLAN FOR WASTE WEIR AT

ADAMS BASIN STA. 3454+20 3449+90

Scales as indicated

Examined and approved

[Signature]

Special (Senior) District Engineer

May 18 1908

The Brockport Waste Gate and Weir is located in Brockport on the north side of the canal. A new steel grate bridge was constructed in the middle 1960's by State Maintenance Forces to replace the original tow path bridge. Also, the easternmost sluice gate was removed and the gate opening was sealed with concrete.

The waste gate and buttress walls appeared to be in very good condition. Less than 5% of its surface was scaled or delaminated. Core #1, taken from a typical area in the membrane wall, revealed no deterioration. This core had a compressive strength of 4185 p.s.i.

The weir exhibited scaling 1 to 2 inches in depth over approximately 10% of its area. Sounding revealed delaminations covering less than 5% of its surface. Core #2, taken in a typical weir area, revealed no deterioration of the concrete, but the concrete was cracked about 5 inches below the surface.



North Side, Note core holes #1 and 2
Brockport Weir and Waste Gate



Canal Side
Brockport Weir and Waste Gate

Both abutments were in good condition with scaled or delaminated areas covering less than 5% of the surface area.

Conclusion

The waste gate, weir, and abutments were in very good condition. No repair work is presently anticipated.



West Abutment
Brockport Weir

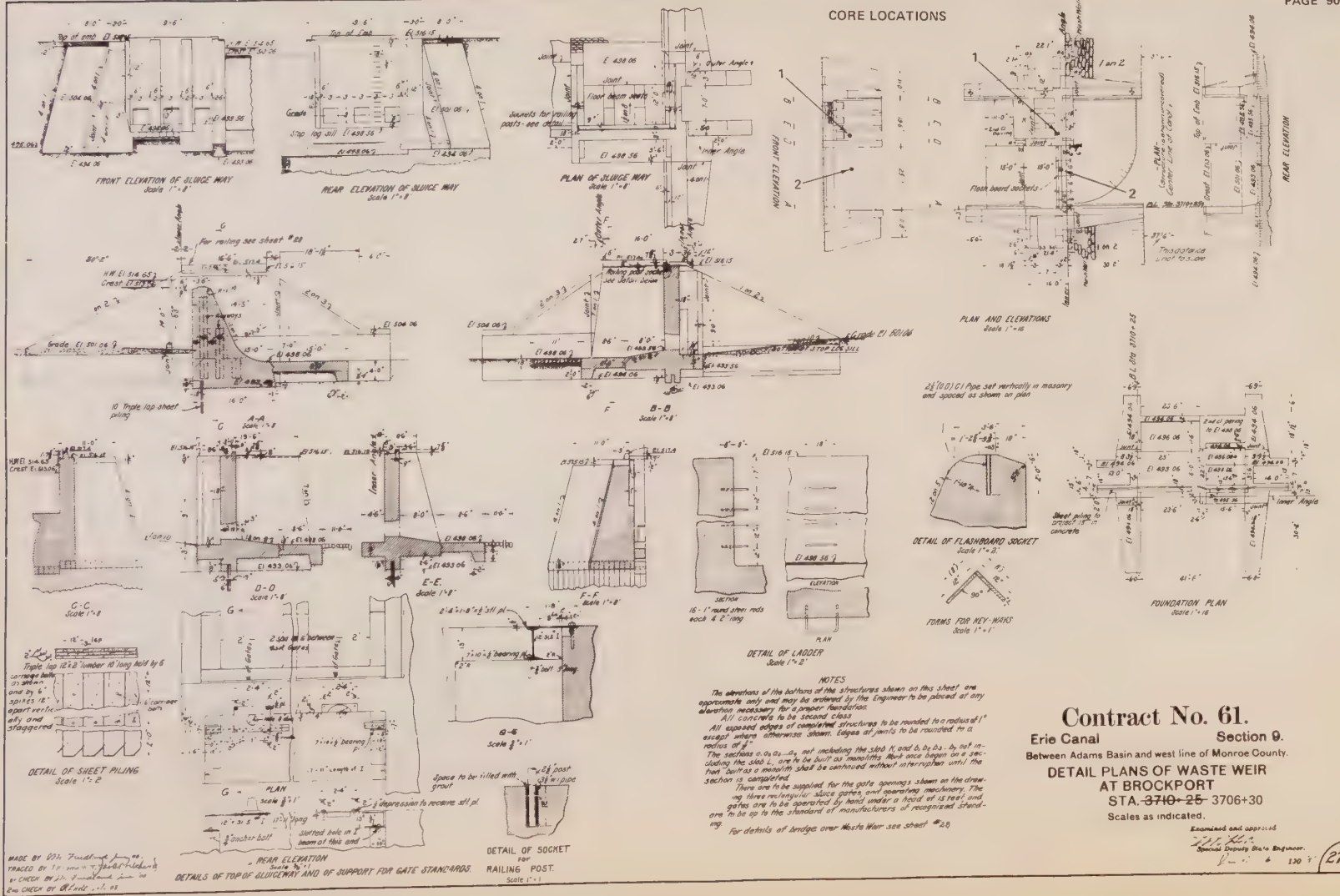


East Abutment
Brockport Weir

BROCKPORT WEIR AND WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|--|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|---------------------|
| 1 | Waste Gate, North Side, Center of West Panel, 5' Above Floor | 0 | 0 | At 6" | 13" | 13" | |
| 2 | Weir, North Side, 15' From West Abutment, 6' Above Bottom | 0 | 0 | 0 | 10" | 10" | Core cracked at 5". |





The Holley Waste Gate and Weir is located east of Holley on the south side of the canal at the east end of the Holley Trough. This waste gate is unique since energy dissipator pools are located below the sluice gate outlets. The weir extends east of the waste gate.

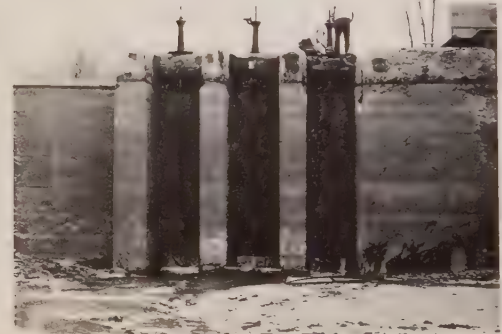
The waste gate membrane wall exhibited scaling, efflorescence, and delaminations covering 90% of its south side. Cores #4 and 5, taken from the south side of the membrane wall, indicated deterioration to 6 and 9 inches, respectively. The north side of the membrane wall exhibited deep cracking. Core #7, taken from the north side of this wall, indicated deterioration deeper than 11 1/2 inches. The buttresses were scaled along their outer edges, but for the most part appeared sound. Core #6, taken from a center buttress in a typical area, indicated deterioration to 3 inches. Although both cores had 1 or 2 small fractures, Cores #4 and #6 had compressive strengths of 4040 and 3600 p.s.i., respectively.



South Side, Note energy dissipation pool in foreground. Holley Waste Gate



South Side
Holley Weir



Canal or North Side
Holley Waste Gate

CONCLUSION

Canal Maintenance Forces have repaired the top of the east abutment and the crest of the weir. Most of the south side of the weir exhibited scaling and delaminations. Core #1, from the south side of the weir, indicated deterioration existed to a 18 inch depth. The north side exhibited deep cracking. Core #3, from the north side of the weir, indicated deterioration deeper than 21 inches.

The south half of the east abutment wall was cracked or delaminated over approximately half of its surface. Core #2, taken from this abutment, indicated deterioration to 18 inches. The north half of the east abutment wall exhibited deep scaling along its lower section. The west abutment was mostly sound.

Deterioration 6 to 12 inches in depth exists over most of the waste gate membrane wall. Deterioration approximately 3 inches in depth exists along the sides of the buttresses and deeper deterioration exists on the end faces of the buttresses.

Although deep deterioration exists on both sides of the weir, the massiveness of the weir provided for a generally sound structure. Deep deterioration also exists in the east abutment.

Repairs to all structure components should include removal of unsound concrete and bonding new concrete to sound concrete surfaces.



Canal Side, Note repairs to weir
crest and top of east abutment.
Holley Waste Gate and Weir



East Abutment
Holley Weir

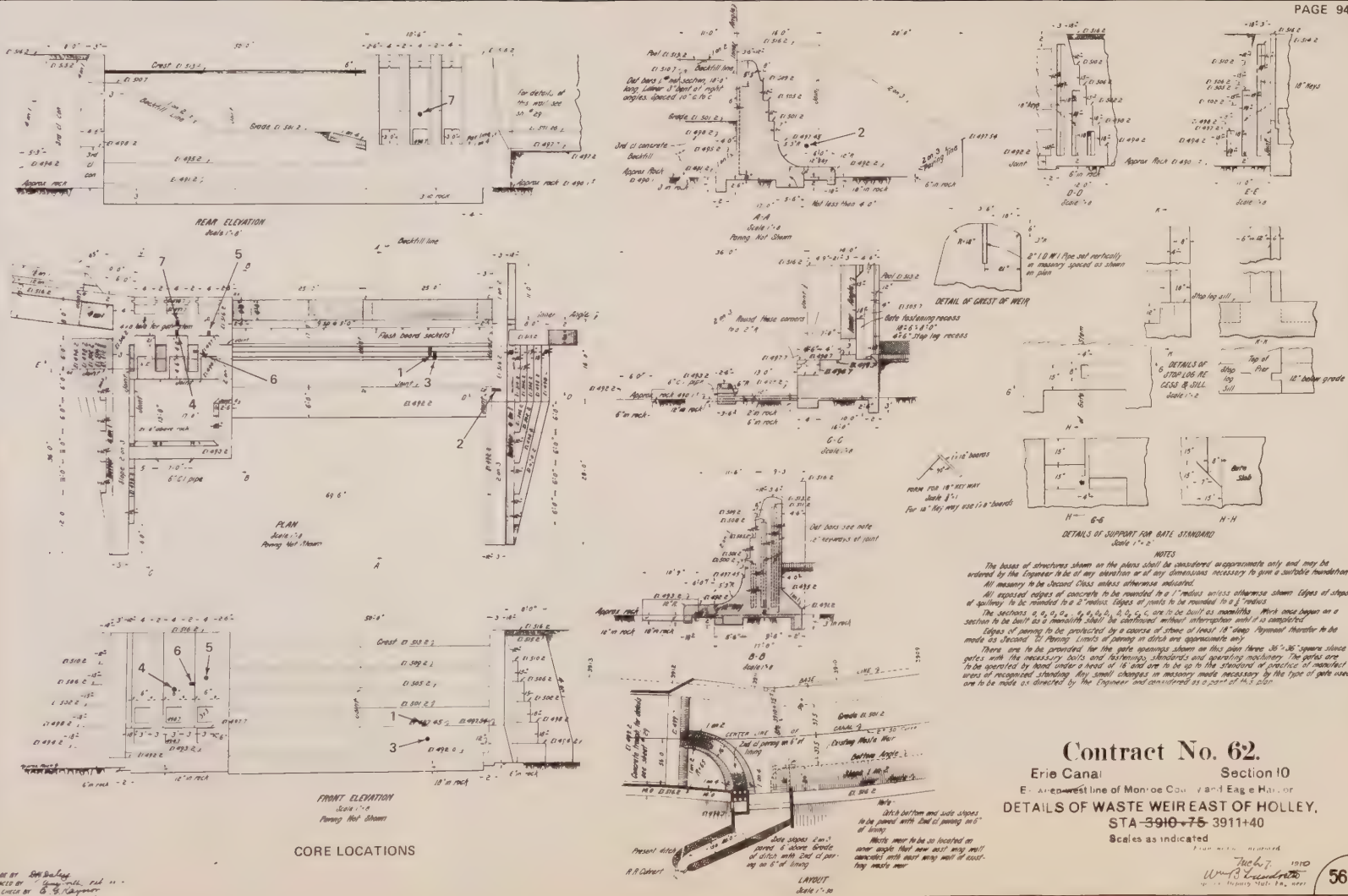


West Abutment
Holley Waste Gate

HOLLEY WEIR AND WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|---|---------------------|---------------------------|---------------------------|------------------------|--------------------|--|
| 1 | Weir, South Side, 13' From East Abutment, 6' From Bottom | 0 | 18" | At 22" | 26" | 26" | |
| 2 | East Abutment, 6' From South Side of Weir, 4' From Bottom | 0 | 18" | At 12" | 20" | 20" | |
| 3 | Weir, North Side, 12' From East Abutment, 3' From Bottom | 0 | 21" | At 9" and 16" | 21" | 21" | Deeper deterioration exists. |
| 4 | Waste Gate, South Side, Center of West Panel, 7' Above Bottom | 0 | 6" | At 11" | 14½" | 14½" | Heavy efflorescence, sounds hollow. |
| 5 | Waste Gate, South Side, Center of East Panel, 9' Above Bottom | 0 | 9" | 0 | 12" | 12" | Heavy efflorescence, sounds hollow. |
| 6 | Waste Gate, South Side, East Center Buttress, Center of East Side, 8' Above Bottom | 0 | 3" | 0 | 12½" | 12½" | Crack extends length of core, sounds solid. |
| 7 | Waste Gate, North (Canal) Side, Center of Middle Panel, 7' Above Bottom | 0 | 11½" | At 6" | 11½" | 11½" | Sounds hollow. Deeper deterioration exists. |





Contract No. 62.

Erie Canal Section 10
E. A. - west line of Monroe Co. and E. of H. of
DETAILS OF WASTE WEIR EAST OF HOLLEY,
STA-3910-75-3911+40

Scales as indicated

Plan section - reduced

Fig. 67
W. B. Bailey
11110
11110
11110

BROCKVILLE WEIR AND WASTE GATE

The Brockville Waste Gate is located east of State Route 387 on the north side of the canal. This structure is a combination waste gate and weir as high water is allowed to run over the membrane wall of the waste gate. The buttress at the center of the membrane wall also serves as a pier to support the concrete slab tow path bridge over the structure. Four sluice gates are located in the membrane wall. Three 7 foot 8 inch by 4 foot high box culverts (Culvert #71) are under this structure.

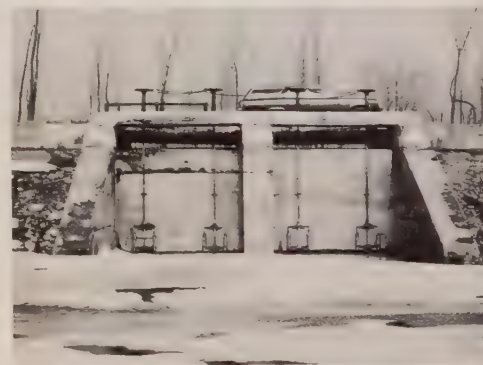
The membrane wall appeared in good condition and sounding revealed no delaminations. A core taken from the membrane wall confirmed the good condition of the wall. This core had a compressive strength of 8870 p.s.i. The buttress exhibited deterioration along its outer edges, but the remaining 90% of the pier was in good condition.



Looking West, Note partially missing railing. Brockville Waste Gate and Weir



Looking South
Brockville Weir and Waste Gate



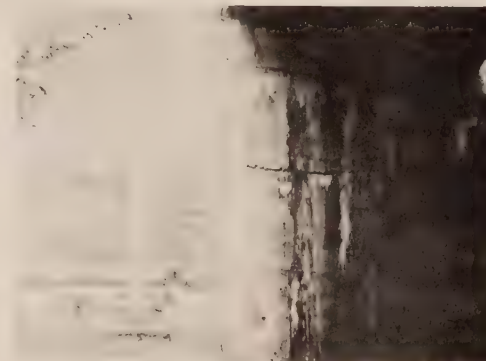
Canal Side, Looking North
Brockville Waste Gate and Weir

The slab supporting the gate valve standards contained deterioration in the form of scaling or cracking over approximately 15% of its surface. Both abutments exhibited cracking or efflorescence covering about 20% of their surfaces, but basically they were sound.

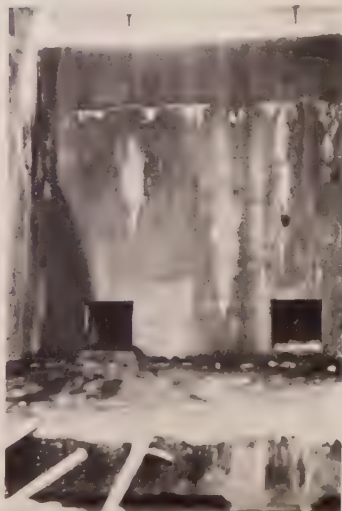
Approximately two-thirds of the tow path bridge railing was missing. This railing should be replaced.

CONCLUSION

Deterioration in this structure is confined to scaling and cracking along the edges of the slabs and pier. Repairs to these areas are recommended.



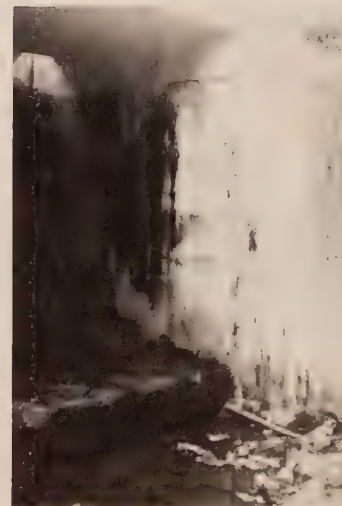
East Abutment
Brockville Weir



East Half, Note Culvert 71 exits under slab in foreground. Brockville Weir



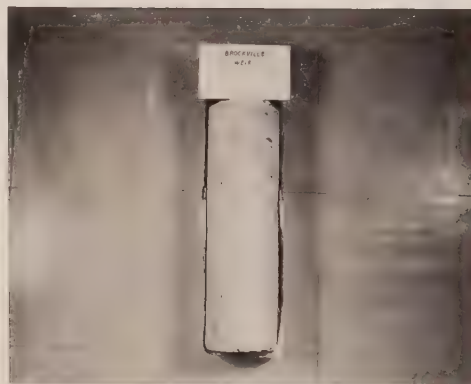
West Half, Note Culvert 71 exits under slab in foreground. Brockville Weir

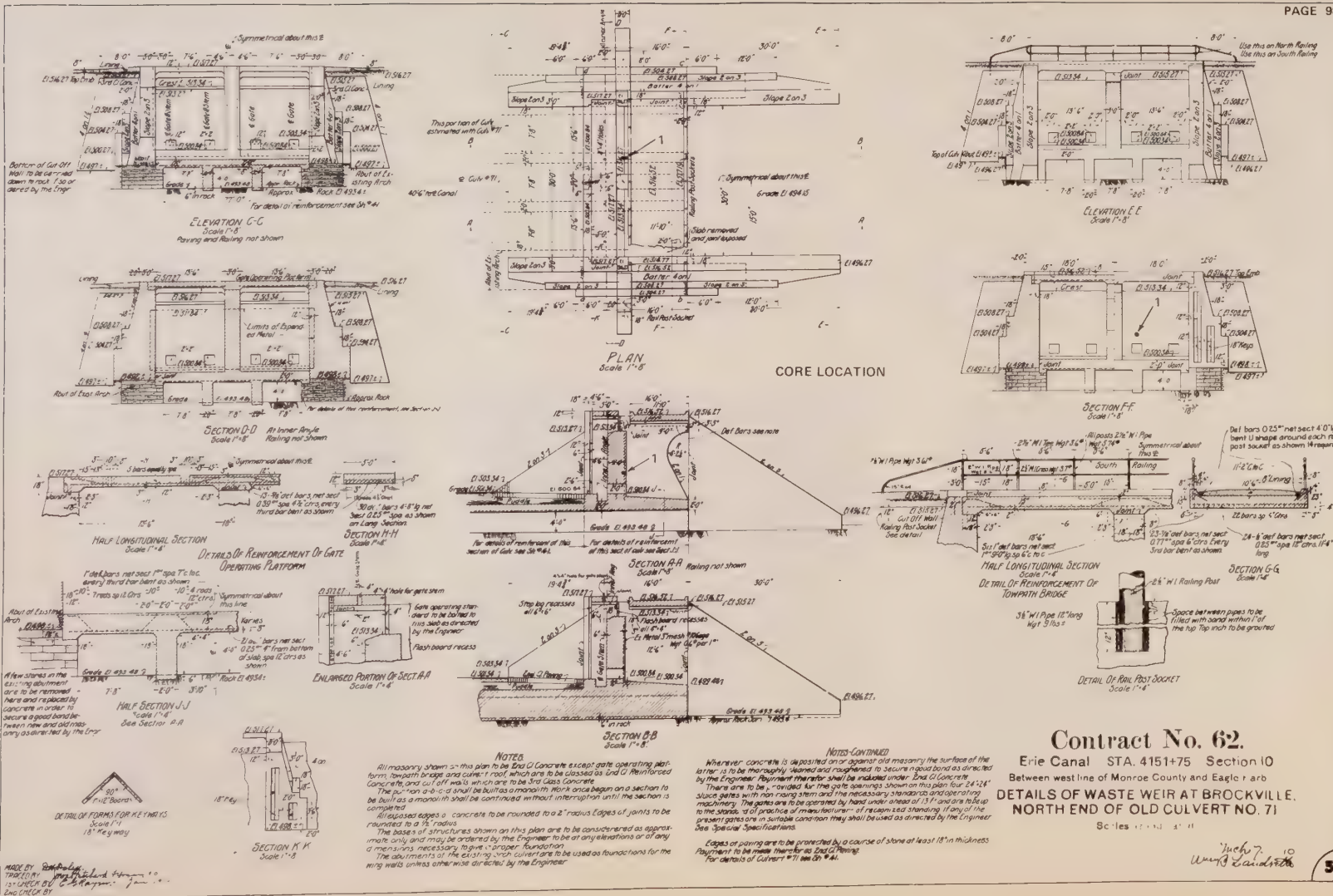


West Abutment
Brockville Weir

BROCKVILLE WEIR AND WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|--|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|-------------------|
| 1 | Weir and Waste Gate, North Side, 3' West of Center Buttress and Pier, 4½' Above Floor | 0 | 0 | 0 | 13" | 13" | Cored thru joint. |





The Albion Waste Gate and Weir is located in Albion on the south side of the canal. Water discharged from the waste gate flows into Culvert 77, located directly beneath the waste gate. The weir is located over the waste gate and also extends west of the waste gate.

The original Barge Canal plans of the weir and waste gate show an existing masonry weir and waste gate. This masonry structure was faced on the back or canal side and capped with concrete. Later, the south side of the weir and waste gate was faced with concrete by Canal Maintenance Personnel.

A reinforced concrete slab extends over the top of the waste gate. Five openings are situated beneath the slab at the elevation of the canal water surface. The slab contained extensive scaling and delaminations along the edges. The pedestals upon which the waste gate valve standards rest also contained extensive deterioration.



Looking West
Albion Weir



Albion Waste Gate and Culvert 77
Entrance After Cleaning Out, 1976
Note Core Hole #1



Canal Side
Albion Waste Gate and Weir



Looking East, Note old dry dock valves
and pipeline pedestals partially hidden
by vegetation. Albion Weir

Three of the 4 sluice gate openings in the waste gate are located directly over Culvert 77. The 4th sluice gate discharged into an old canal drydock area which was abandoned and walled off before the Barge Canal was built. This sluice gate is plugged with concrete and inoperative. Soundings along the upper south side of the waste gate revealed little delamination. Scaling, delamination and other deterioration existed in the vicinity of the sluice gate openings. Core #1, taken from the south side of the waste gate, revealed a sound facing 16 inches in depth, and an older concrete facing beneath it. Core #2, taken directly opposite of Core #1, on the canal side of the waste gate, indicated deterioration to 6 inches in depth.

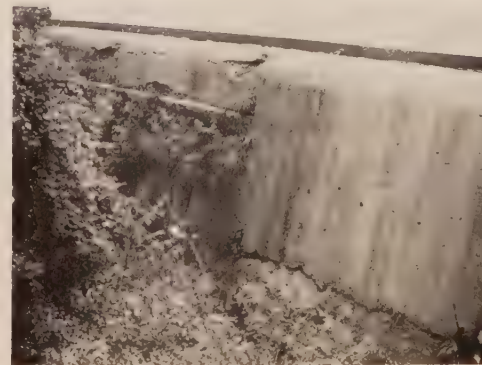
The concrete which encases the weir was mostly sound. The west half of the weir (notch area) showed some distress along its upper portion where vegetation was observed growing. The east abutment appeared to be in very good condition. Little scaling or delamination was observed along this abutment.



East Abutment
Albion Weir



Albion Waste Gate and Culvert 77
Entrance, 1975



Recent Repairs on East Half of Weir
Albion Weir

The west abutment is stone masonry. A small stream of water was observed coming through this wall area which was hidden by dense vegetation.

CONCLUSION

The concrete encased masonry waste gate and weir are sound. An old mill foundation and the dry dock walls in front of the waste gate and weir make the structure appear to be in worse condition than it actually is. Future repairs should include repair or removal of the concrete slabs and valve standard pedestals. The deteriorated concrete around the 3 sluice gate openings should be removed and replaced with a durable concrete bonded to the existing structure. These repairs should be in conjunction with repairs to Culvert 77 which is directly underneath. Those sections of the weir which show deterioration should be removed and replaced with concrete.



Old Dry Dock Valves, Note quantity of leak water coming out dark hole which comes through rubble wall at west end of Albion Weir



Albion Waste Gate Area
After Being Cleaned Out

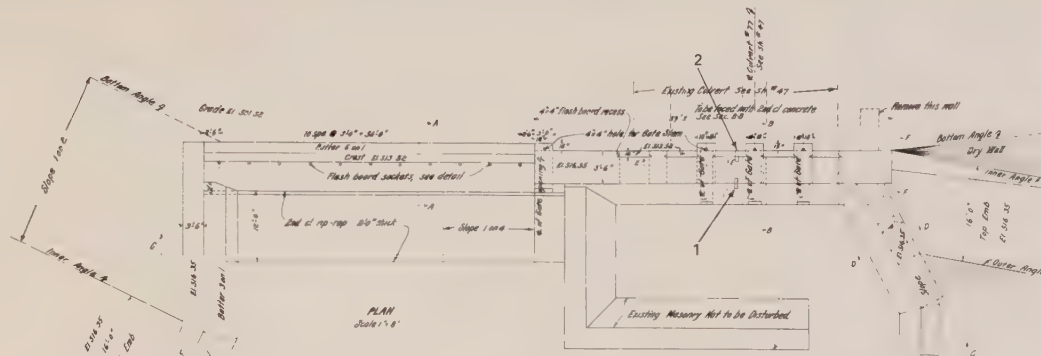


Stone Wall East of
Albion Waste Gate

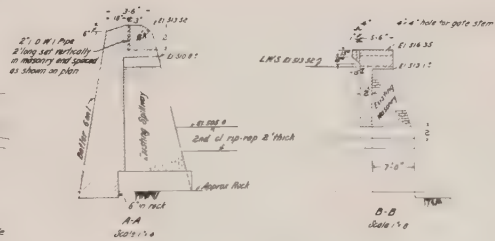
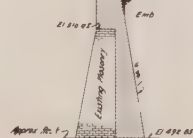
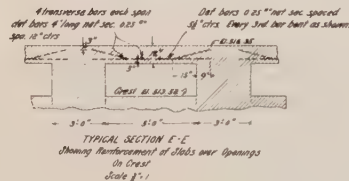
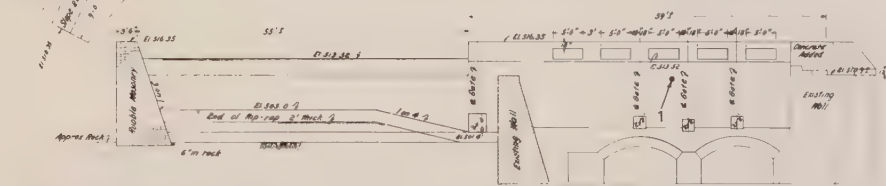
ALBION WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|--|
| 1 | Waste Gate, South Side, 18' From East Abutment, 5' Below Top of Wall | 0 | 0" | At 10" | 17" | 17" | Newer concrete facing, into old concrete at 16". comp. str. 3515 psi |
| 2 | Waste Gate, North (Canal) Side, 18' From East Abutment, 5' Below Top of Wall | 0 | 6" | At 10" | 20" | 20" | comp. str. 7255 psi |





CORE LOCATIONS



NOTES

The existing masonry wall is to be capped and faced with Jomed Glass Concrete as shown by the plans or directed by the Engineer. At least one $\frac{3}{4}$ " dowel 15" long is to be placed in every 9 sq ft of surface of old wall where adjoined by new concrete masonry. Dowels to penetrate 9" into old masonry.

All new masonry to be Second Class Concrete except mast wing wall which is to be of rubble masonry and
in mortar

Exposed edges of concrete to be rounded to a 1" radius Edges of joints to a $\frac{1}{2}$ " radius

All details not shown by this plan to be furnished by the Engineer

The same gate openings are to be maintained as exist at the present weir. There are to be supplied for these openings three 24" x 24" sluice gates and one 36" x 36" gate, together with standards and operating machinery and all necessary bolts and fastenings. All new gates furnished are to be up to the standard of practice of manufacturers as recognized standing. The existing gates may be used if so directed by the Engineer. See special specifications.

Any small changes in the masonry made necessary by the type of gate used are to be made as directed by the Engineer and considered a part of this plan.

Any masonry in the existing weir found to be unsuitable to be left in the finished work shall be removed and replaced by Second Class Concrete as directed by the Engineer

Contract No. 62.

Erie Canal STA. 4411+50 Section 10

Between west line of Monroe County and Eagle Harbor.

DETAILS OF WASTE WEIR AT ALBION,
AT SOUTH END OF OLD CULVERT NO. 77

Scales as indicated

Examined and approved

Wm B Landrum
Special Deputy State Engineer

MADE BY *D. Bailey*
 TRACED BY *1. [unclear]*
 1st CHECK BY *MCK 3.8/10*
 2nd CHECK BY *Ca. [unclear]*

The Eagle Harbor Waste Gate and Weir is located east of Eagle Harbor on the south side of the canal. The waste gate membrane wall is supported by 3 buttresses, and 3 gate openings extend through the membrane wall. The weir extends 75 feet to the west of the waste gate.

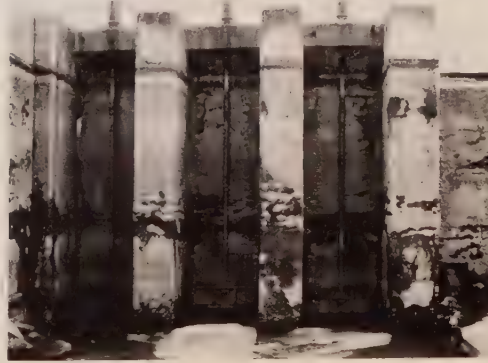
As was found on other concrete structures along the canal, the front side of the waste gate and weir have been completely covered with shotcrete, making it difficult to visually inspect this portion of the structure. This shotcrete was from $\frac{1}{4}$ to $\frac{1}{2}$ inch in thickness, and in most cases, was loosely bonded to the concrete.

Cores #1 and 3, taken from the membrane wall of the waste gate, indicated deterioration to 4 inches in depth. Cores #1 and 3 had compressive strengths of 5790 and 9175 p.s.i. respectively. A close examination of the buttresses indicated severe deterioration along their outer extremities. Core #2, which was cored into the end of a buttress and toward the membrane wall, revealed that the outer 2 feet of the buttresses were rubble.

Cores #4 and 5 were taken in typical areas from the front of the weir. These cores showed deterioration to 8 inches in depth.



South Side, Note core holes #1, 2 and 3, right to left. Eagle Harbor Waste Gate



Canal Side
Eagle Harbor Waste Gate



Canal Side, Note repairs along crest of weir. Eagle Harbor Weir and Waste Gate

Both abutments were covered with shotcrete, but soundings in areas where the shotcrete has fallen off indicated less than 10% of the surface delaminated.

CONCLUSION

Future repair work should include removal of the shotcrete and deteriorated concrete to sound material. The structure should then be encased in new concrete to prevent further deterioration.

Due to the canal being full of water at the time of coring, no cores were taken from the back side of the structure. Earlier visual examination, along with our experience with similar structures, indicated that the back side was in the same condition, if not better, as the front side.



West Abutment
Eagle Harbor Weir



Looking West
Eagle Harbor Weir



Looking East
Eagle Harbor Weir

EAGLE HARBOR WEIR AND WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|--|---------------------|---------------------------|---------------------------|------------------------|--------------------|---|
| 1 | Waste Gate, South Side, Center of East Panel, 5½' Above Floor | 0 | 4" | 0 | 13" | 13" | Area shotcreted. |
| 2 | Waste Gate, South Side, End of East Buttress, 4' Above Floor | 0 | 23" | 0 | 23" | 23" | Area shotcreted, believe sound concrete at 23". |
| 3 | Waste Gate, South Side, Center of West Panel, 5' Above Floor | 0 | 4" | 0 | 12" | 12" | Area shotcreted. |
| 4 | Weir, South Side, 20' From West Abutment, 5' From Bottom | 0 | 8" | At 11" | 12" | 12" | Area shotcreted. |
| 5 | Weir, South Side, 20' From Waste Gate West Buttress, 4½' From Bottom | 0 | 8" | At 10" | 13½" | 13½" | Area shotcreted. |



MEDINA WEIR AND WASTE GATE

The Medina Waste Gate and Weir is located in Medina on the south side of the canal. Water discharged from the gates flows eastward through an abandoned water control structure into Oak Orchard Creek and eventually feeds a power generation facility.

The weir extends to the east of the waste gates for 150 feet, and abuts the southern side of the Medina Trough. The weir extends approximately 20 feet above bedrock.



Looking East, Niagara Mohawk Waste Gates at right, Medina Trough (Culvert 99, Medina Aqueduct) in background. Medina Weir



Looking West, Medina Harbor in background. Note vegetation on weir. Medina Waste Gate and Weir



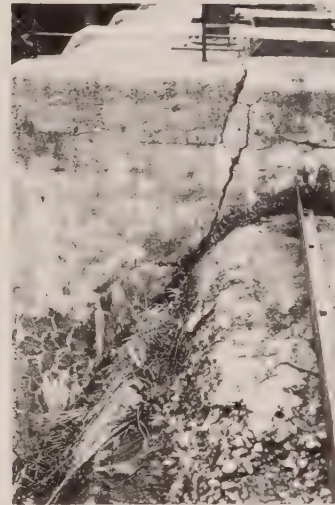
Canal or North Side Medina Weir and Waste Gate

The waste gate is 18 1/2 feet high and 45 feet long with six sluice gates. Gate #1 was closed and inoperative, and gates #3, 4, and 5 leaked a considerable amount of water when closed. A horizontal construction joint approximately 9 feet from the bottom had deteriorated to the point where water was leaking through it. Three sections of the membrane wall contained vertical cracks extending from the top down to the construction joint and completely through the wall. All buttresses, except the center one, have cracks from their outside edges extending downward in a diagonal direction to the construction joint of the membrane wall. Vegetation was growing from these joints and cracks.

Cores taken from the membrane walls indicated deterioration from 2 to 6 inches in depth. Two cores taken in the buttresses showed deterioration to 6 inches in depth. In areas where sounding was possible, deterioration was detected on approximately 30% of the membrane wall and buttresses.



Leakage Through Closed Gates, Note
horizontal joint and vertical cracks.
Medina Waste Gates



Looking West, Cracks in top of waste gate.
Medina Weir and Waste Gate



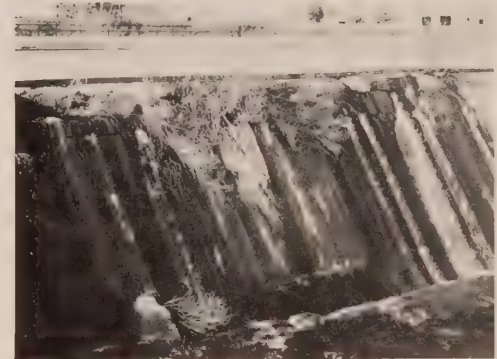
Canal Side
Medina Waste Gates
Note kids at left using top of weir as short cut.

Sounding along the bottom of the south side of the weir indicated some delaminated areas and the weir exhibited only minor scaling. The top portion of the weir, mainly the west half, was seriously deteriorated with numerous cracks and chunks of concrete missing. Water was running freely through cracks and the construction joint, and brush was growing along the crest. The north side of the weir exhibited deep deterioration along its top, but the lower section was in good condition.

CONCLUSION

Further deterioration and cracks in the membrane wall and buttresses greatly reduce the factor of safety used in the design of the waste gate. We therefore recommend that all deteriorated concrete be removed to sound material. The entire structure should then be encased in new concrete to prevent seepage of water through the cracks and stop freeze-thaw deterioration of the existing concrete.

The top of the weir, especially the west half, should be removed and replaced. Any other deteriorated concrete found should be removed until sound concrete is reached. The weir should then be encased in new concrete to prevent further deterioration.



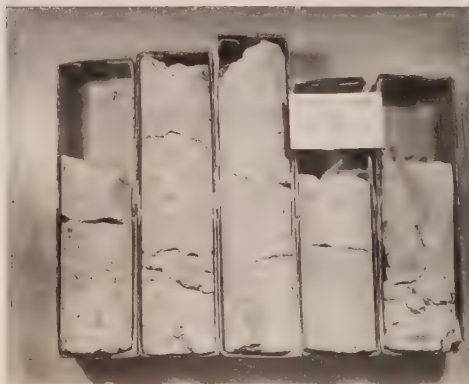
West End of Weir, Area of Filled Notches
Medina Weir

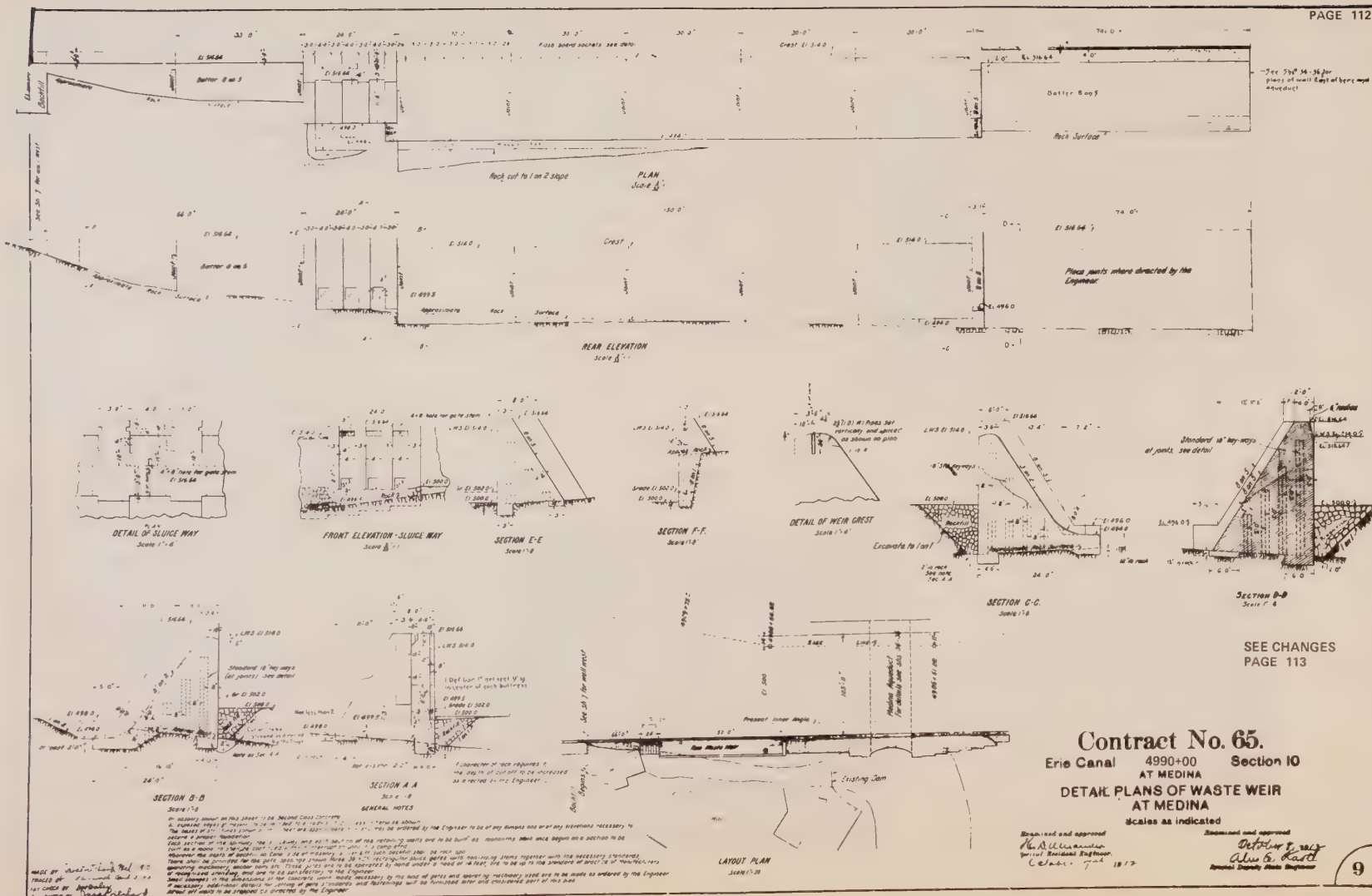


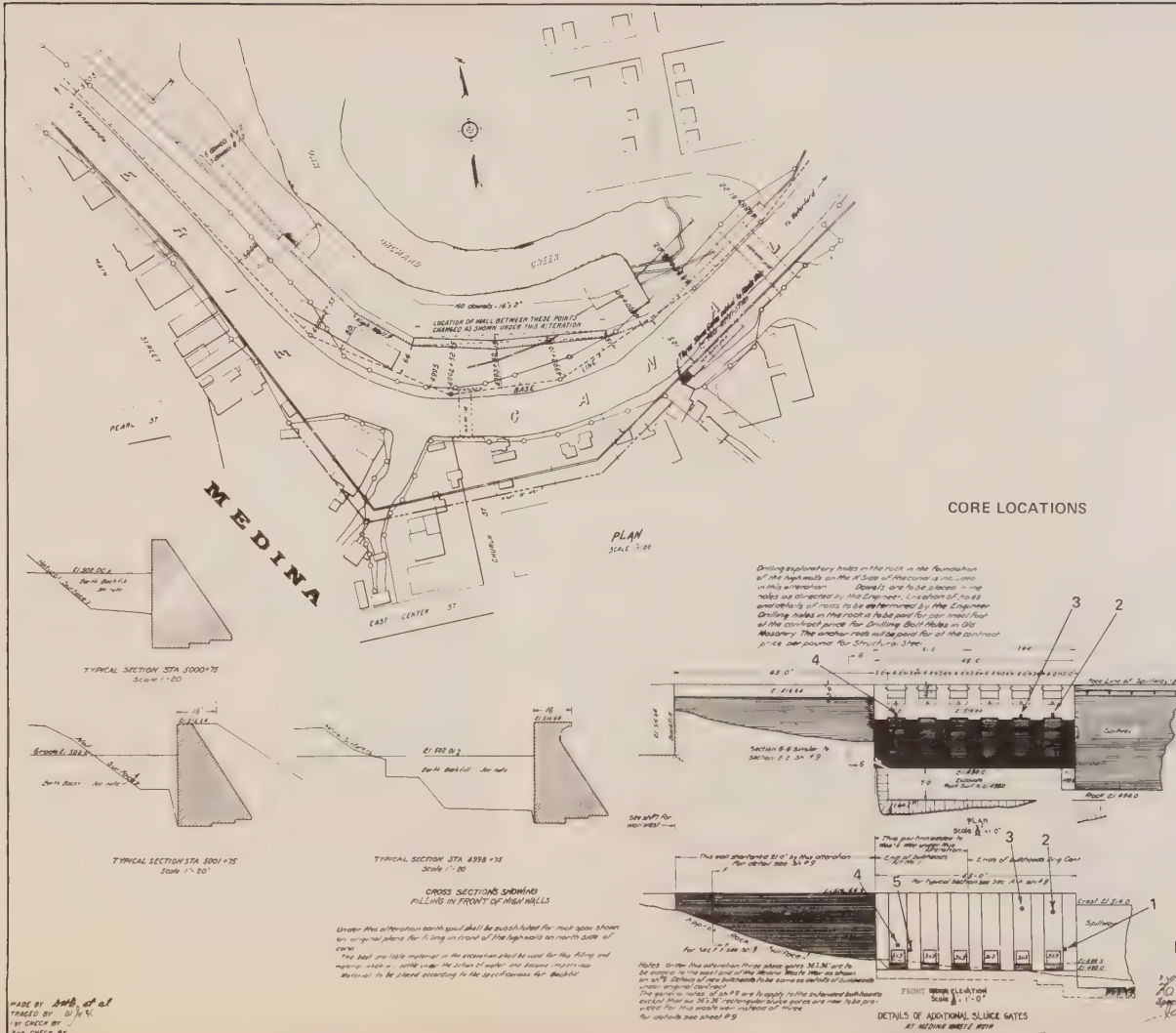
Looking West Along Crest of Weir
Medina Weir

MEDINA WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|--|---------------------|---------------------------|---------------------------|------------------------|--------------------|--|
| 1 | Easternmost Buttress, West Side, 6' From Wall, 4' Above Floor | 0 | 4" | At 6½" | 10" | 10" | Hollow sounding. |
| 2 | Center of Easternmost Panel, South Side, 5' From Top | 0 | 6" | At 11" | 16" | 16" | Hollow sounding. |
| 3 | Center of 2nd Panel From East, South Side, 4' From Top | 0 | 5" | At 9" | 17" | 17" | Hollow sounding. |
| 4 | Center of Westernmost Panel, South Side, 5' From Bottom | 0 | 2" | At 5½" | 9" | 9" | Solid sounding. |
| 5 | 2nd Buttress Wall From West, West Side, 4' From Wall, 4' From Bottom | 0 | 6" | * | 10" | 10" | * Cored through horizontal crack into piece of wood. |







MEDINA WEIR
Contract No. 65.
ALTERATION NO. 3
e Canal Section 10
AN & DETAILS OF ALTERATIONS IN
H WALL ON NORTH SIDE OF CANAL
Scale as indicated

H. S. Alexander
 Special Agent in Charge
 January 13th 1914

Examined and approved
January 13 1924
Alex. E. Knott
Special Deputy State Engineer

This structure is located in Middleport on the south side of the canal. It is composed of a 60 foot long stone masonry weir on the east end, a 9 foot wide concrete waste gate in the middle and a 30 foot long, 22 foot high stone masonry wall over Culvert 107 on the west end. The stone masonry dates to the 1862 Erie Canal enlargement or earlier.

Water exiting from the two waste gate openings flows immediately around a corner and drops 5 feet into a culvert well. From there it passes through the twin barrels of Culvert 107.

Around 1910, the concrete waste gate was constructed and a 1 foot thick concrete wall was placed behind the masonry weir. Some time ago, Canal Maintenance Personnel covered the canal side of this structure with a 1/2 inch thickness of shotcrete and repaired the top of the waste gate. A pedestrian bridge over the weir was recently constructed.

No shotcrete was placed on the concrete waste gate. Many cracks and some efflorescence were visible on this wall surface and approximately 60% of it sounded delaminated. Core #3, taken near the center of the wall, revealed rubble to a depth of 2 inches and cracking to a depth of 10 inches. Cores #1 and 2 were taken from the back or canal side of the 3 foot thick membrane wall and indicated deterioration to 6 and 8 inches, respectively.



Looking East, Culvert 107 Entrance under wall in foreground, Waste Gate and Weir in background, Note new pedestrian bridge over weir.



Canal Side, Looking East, Note concrete wall behind weir and shotcrete repairs.
Middleport Weir



Looking East, Stone Masonry Weir, 1-Foot Thick Concrete Wall on Canal Side of Weir. Middleport Weir

The main problem with the waste gate was the concrete lining the sides of the two openings. It was fractured and chunks had washed away. This could cause support problems for the metal channels holding the sliding doors in place. As it was, the gate control mechanisms worked very hard and the gates could not be closed at the time.

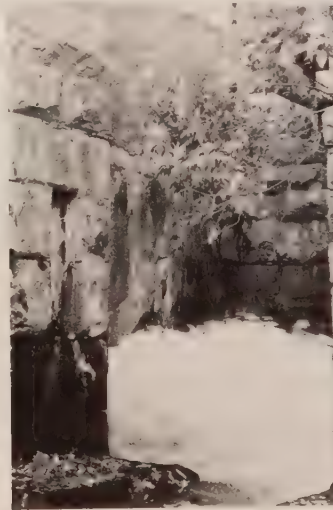
The stone masonry weir was in good condition and had little seepage through it. Leakage through the high wall over the Culvert 107 entrance, however, was excessive. Measures to stop this flow and repair the Culvert 107 entrance are to be started early in 1977.

CONCLUSION

Repair of the waste gate should include patching or replacing the concrete lining in the openings which supports the doors. Region Canal Maintenance Personnel have scheduled this work to begin early in 1977 in connection with Culvert 107 repairs. These repairs should include the removal of all deteriorated concrete, or the complete replacement of this small concrete wall. We do not anticipate any other repairs at this time.



Canal or North Side, Note core holes
#1 (bottom) and #2 (top).
Middleport Waste Gate



South Side, Note repairs to top of waste
gate behind branches. Middleport Waste Gate

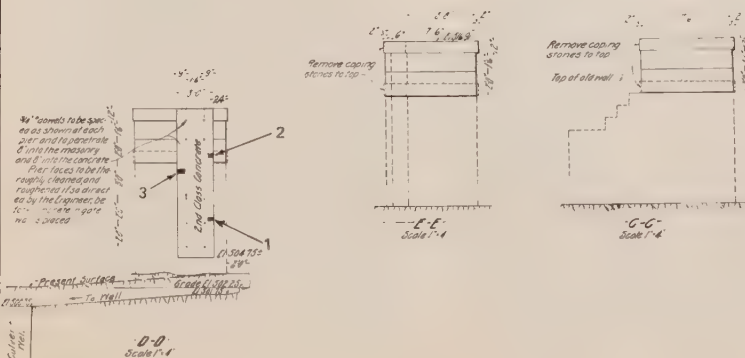
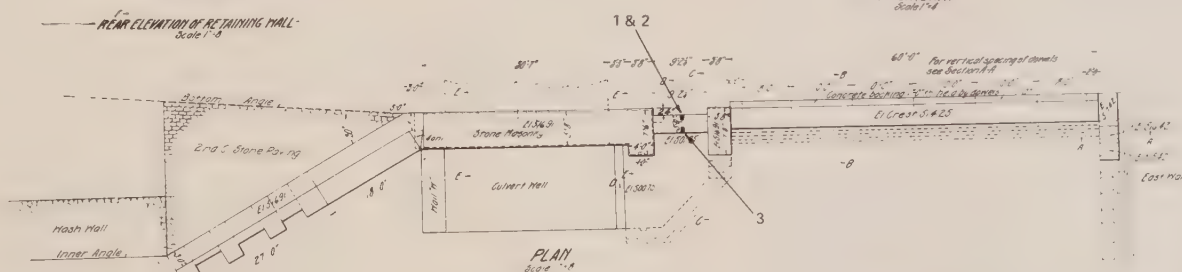
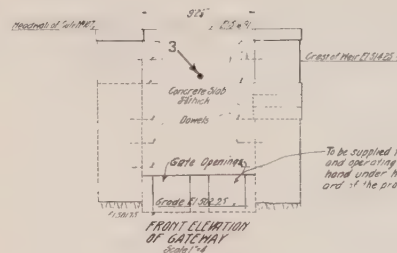
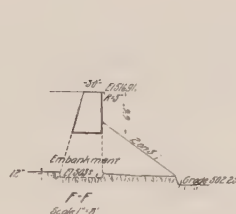


Stone Masonry Wall Over Culvert 107
Entrance, Creek Cascades Over Dam in
Foreground, Note leakage from arch stones.

MIDDLEPORT WASTE GATE

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|---|---------------------|---------------------------|---------------------------|------------------------|--------------------|-----------------|
| 1 | Middle of Waste Gate, North (Canal) Side, 6' From Bottom | 0 | 6" | 0 | 11½" | 11½" | Sounded solid. |
| 2 | Middle of Waste Gate, North (Canal) Side, 11' From Bottom | 0 | 8" | 0 | 12½" | 12½" | Sounded hollow. |
| 3 | Middle of Waste Gate, South Side, 5' From Top | 0 | 10" | 0 | 15" | 15" | Sounded hollow. |





Contract No. 64.

Erie Canal Section 10
Between Medina and Gasport
PLANS FOR MIDDLEPORT WASTE WEIR
AT STA. ~~5260+00~~ 5259+00

Scales as indicated

Examined and approved

² Special Deputy State Engineer
February 23rd 1894

February 2nd 1896

(27)

The Watson Waste Gate and Weir is located 2 miles west of Middleport on the south side of the canal. The waste gate has two openings and is supported by two buttresses. The weir is located to the west of the waste gate. A construction joint runs horizontally across the entire length of the structure 8 feet above bedrock.

The top section of the waste gate, above the construction joint, was sounded and few delaminations were detected. This section also exhibited little or no cracking and scaling. The bottom portion of the gate sounded delaminated and exhibited cracks and scaling over approximately 25% of its area. Deterioration and leakage existed along the construction joint. Core #1 was taken from the front of the membrane wall below the construction joint. Slight cracking was observed to a depth of only 1 1/2 inches. This core had a compressive strength of 5815 p.s.i.

The buttresses were in much the same condition as the membrane wall. The upper parts of the buttresses were in good condition and the lower sections below the construction joint showed cracking and delaminations. Leakage of water through the construction joint has caused the bottom section of this structure to deteriorate much more rapidly than the top section. Little difference in concrete quality was evident between the top and bottom sections on the canal side of the structure.

Much leakage through the construction joint was also occurring along the weir, especially at the east end. Delaminations were detected on approximately 30% of the top 3 1/2 feet of the weir. Scaling up to 1 1/2 inches in



Looking East, East Abutment
Watsons Weir and Waste Gate



South Side, Note core hole #1
and horizontal joint.
Watsons Waste Gate



North Side, Note horizontal joint.
Watsons Waste Gate

depth was also present. The bottom section of the weir also exhibited scaling over most of its surface. As with the waste gate, this form of deterioration was attributed to leakage of water through the construction joint. Soundings revealed delaminated areas covering 20% of its surface. Core #2, taken from the front of the weir in a scaled area below the construction joint, indicated deterioration 5 inches deeper than the 4 inch deep scaling present on the surface. Much of the area behind the weir has been backfilled.

The construction joint also extended through the east abutment. The upper section of the wall was in generally good condition with light cracks at the top while the lower section exhibited delaminations on approximately 30% of its surface. The abutment wingwall was in generally good condition with light cracks at the top and bottom, but water was running freely from behind the wingwall. Sheetpiling has been driven behind the abutment in an attempt to cut off this water.



Looking West, West Abutment
Watsons Weir and Waste Gate

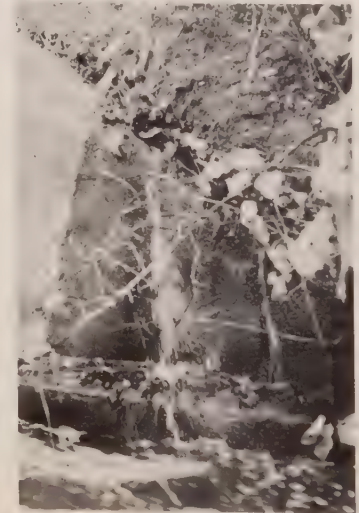
The west abutment exhibits light cracking and efflorescence over half of its surface, but sounding revealed little delamination.

CONCLUSION

Although heavy leakage was occurring through the construction joint, this structure was basically sound. The construction joint through the waste gate and weir should be sealed to prevent further deterioration. The top section and other areas of the weir containing deterioration should be removed and a new top and front face of the weir bonded to the existing sound concrete. Other deteriorated areas of the abutments and waste gate should also be repaired and leakage from behind the east abutment should be cut off.



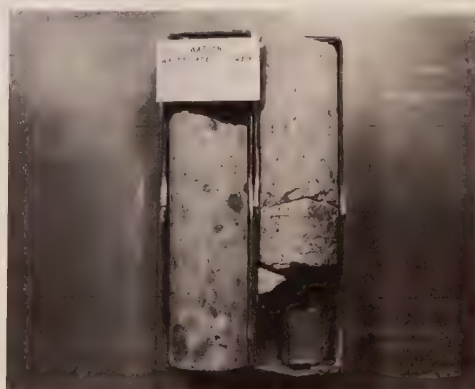
South Side
Watsons Weir



Leak From Behind East Abutment
Watsons Waste Gate

WATSONS WASTE GATE AND WEIR

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|----------------------|
| 1 | Waste Gate, South Side, Center of East Panel, 4½' From Bottom | 0 | 1½" | 0 | 12" | 12" | Solid sounding area. |
| 2 | Center of Weir, South Side, 3½' From Bottom | 4" | 9" | 0 | 13" | 17" | |



This structure is located $\frac{1}{2}$ mile east of Gasport on the north side of the canal and is also referred to as Maybee's Weir.

In 1973, the waste gate and weir were rehabilitated under Contract M73-6. Both sides of the two weirs were refaced, the waste gate was encased in new concrete, the east abutment was rebuilt and the two center piers supporting the tow path bridge were recapped.

Some deterioration in the form of cracking and delaminations (30% of surface) existed in the lower sections of the piers. Most other areas were still in good condition with few cracks and scaled areas.



North Side
Gasport Weir and Waste Gate



East Half of Weir
Gasport Weir and Waste Gate



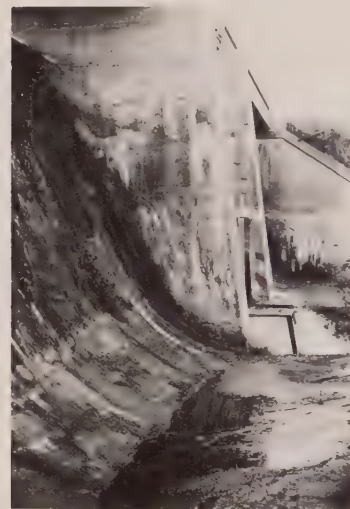
North Side
Gasport Waste Gate

A new steel grate, tow path bridge has been erected over the structure and new gate valve operating mechanisms have been installed.

One core was obtained from the north face of the east weir section. This core had a compressive strength of 4485 p.s.i.

Conclusion

This structure is in very good condition and no repairs are presently recommended. We believe that this structure serves as a good example for future restoration of similar water control structures along the canal.



Looking West, Note repaired west abutment and piers. Gasport Weir and Waste Gate



Looking East, Note repaired east abutment and piers. Gasport Weir and Waste Gate



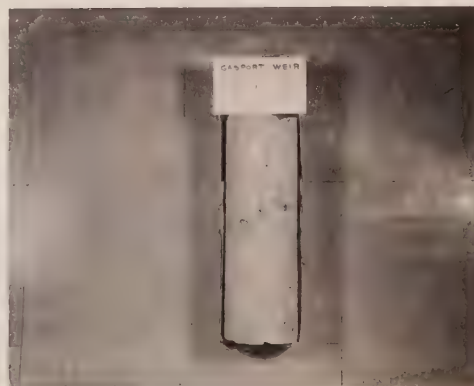
Looking West, Note new facing on both sides of weir. Gasport Weir

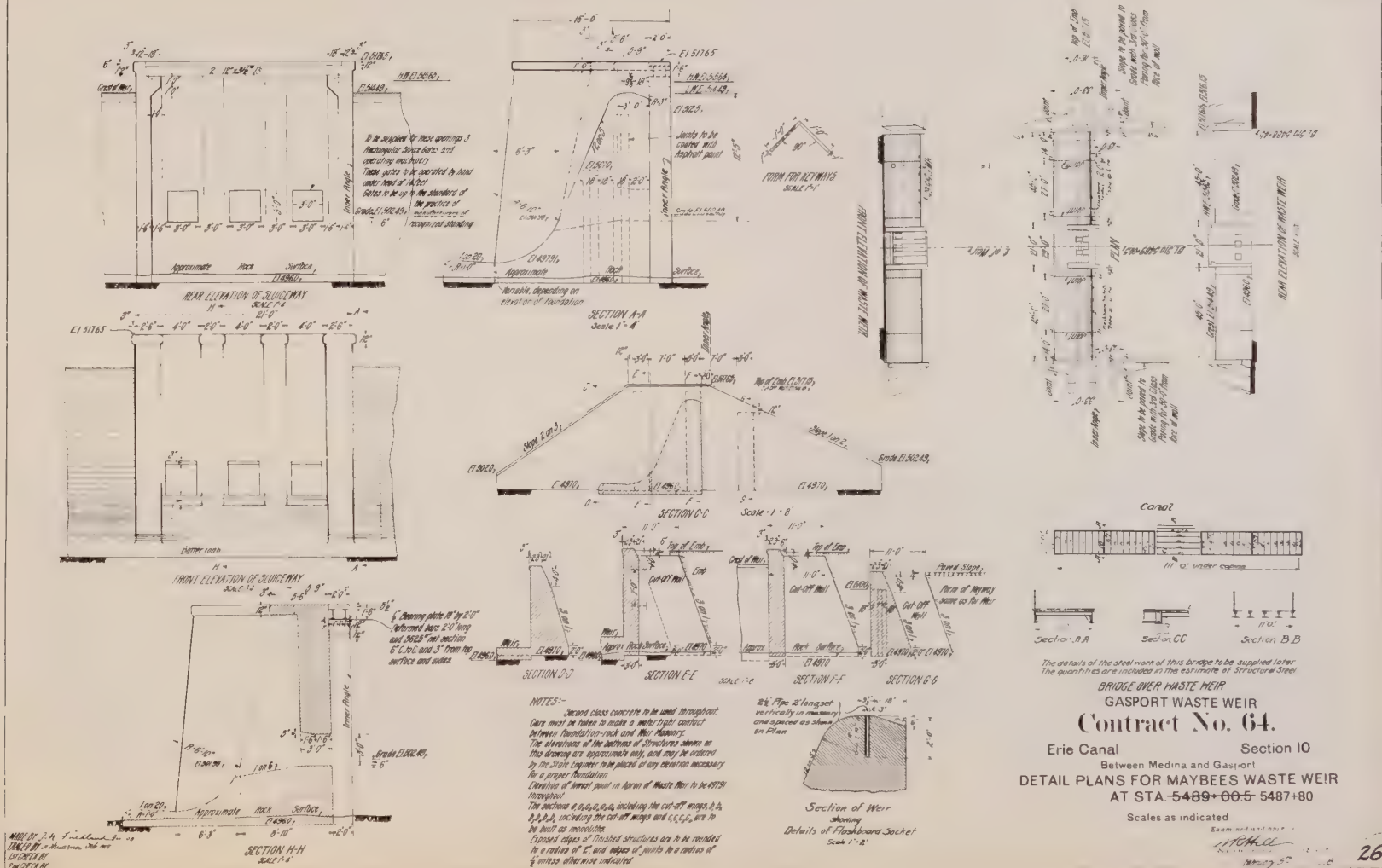


Canal or South Side Gasport Weir and Waste Gate

GASPORT WEIR

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|------------------------|---|-------------------------|-------------------------------|-------------------------------|----------------------------|------------------------|-------------------|
| 1 | North Side, East Weir, 15' From East Pier, 3' From Bottom | 0 | 0 | 0 | 12" | 12" | Recently rebuilt. |





LOCKPORT WEIR AND WASTE GATE

The Lockport Waste Gate and Weir is located in the City of Lockport just west of Exchange Street on the south side of the canal. This structure is composed of a waste gate with three openings, and two sections of weir west of the gate. The weir adjacent to the waste gate was built by encasing in concrete an old stone masonry weir which was part of the Erie Canal. The weir to the west of the concrete and masonry weir is composed of concrete throughout. Another stone masonry weir once extended to the east of the waste gate. Its only present purpose is to serve as part of the retaining wall along the south side of the canal.

The waste gate contains three membrane walls constructed between old stone masonry buttresses. These buttresses have been encased in 10 inches of concrete.

The center membrane wall had cracks and efflorescence covering approximately 20% of its front surface. Sounding of the concrete revealed few delaminations. The western membrane wall appeared to have serious deterioration in the form of cracks and delaminations covering most of its front surface. The eastern membrane wall exhibited cracks and efflorescence covering approximately 20% of its surface. Little delamination of the surface was detected by sounding.

Core #1, taken from the center membrane wall, revealed no deterioration and had a compressive strength of 6250 p.s.i. Core #3, taken from the western membrane wall, showed deterioration to a depth of 13 inches and had a compressive strength of 3930 p.s.i. in its lower section. Core #4, taken from the back of the western membrane wall, revealed deterioration to a 3 inch depth.



Looking West, Note new repairs on west half of weir. Lockport Weir



South Side, Concrete Encased Stone Masonry Walls. Lockport Waste Gate



Looking East, 1975
Lockport Weir and Waste Gate

The concrete encasement of the stone buttresses was distressed. The west buttress had approximately 8 inch deep deterioration. 4 to 5 feet above the foundation and much leakage was apparent through the encasement. The center and east buttresses had cracks and efflorescence over 50% of their surfaces. The center buttress encasement has split away from the membrane wall and a large quantity of water was leaking through this crack. Core #2, taken from the center buttress and through the concrete encasement, revealed deterioration of the concrete to a depth of 6 inches. Water ran freely from the core hole after the core was removed. The sluice gates either could not be completely closed or were inoperative.

The east half of the weir was in very good condition. The surface of the concrete is lightly scaled, but no delaminations were detected by sounding.

During the Winter and Spring of 1976, a 40 foot long deteriorated section was removed from the crest of the west half of the weir. Sound concrete was encountered at a keyed construction joint approximately 2 feet below the crest and a new concrete crest was bonded to the existing concrete. However, isolated areas of deteriorated concrete still exist on the weir face below the repair. Core #1, taken from the front of the weir in a delaminated area, revealed deterioration to a depth of 6 inches.



Canal or North Side, Note stone masonry wall over Culvert 125 at left.
Lockport Weir



Canal or North Side, Looking Southwest
Lockport Waste Gate and Weir



Looking East, 1976 Repairs to Weir,
Note shape of notch on top of weir.
Lockport Weir

The old stone masonry weir east of the waste gate was capped with a concrete wall when the Barge canal was built. This weir consists of a back wall which lines up with the canal retaining wall and a front wall directly over the Culvert 125 entrance. In between is a 10 foot wide area of earth fill capped with stone blocks.

Recently Canal Maintenance Personnel have replaced the concrete cap of the east stone weir in an attempt to stop a large quantity of water which cascades out from the front side of the stone blocks and down into the entrance of Culvert 125. Also, a clay cutoff wall was placed behind the concrete faced, stone block masonry retaining wall extending east toward Exchange Street and the wall surfaces were patched. However, the leak continued when the canal was refilled.



Leak Over the Top of Culvert 125
Lockport Weir



Looking East, 1976. Note removal of shed
over gates, removal of garage on right,
and leak over Culvert 125 entrance.

CONCLUSION

The concrete encasing the waste gate buttresses was deteriorated in many areas. Deep deterioration existed in the west membrane wall and the others also have areas of deterioration.

Future restoration of the waste gate should include removal of the concrete encasing the buttresses and removal of all deteriorated concrete in the membrane wall. Then the entire waste gate should be encased in concrete.

Both of the weirs west of the waste gate were in good condition. No repairs to either structure are presently anticipated.

The heavy leak existing over the top of Culvert 125 should be located and sealed.

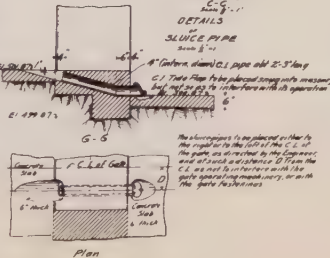
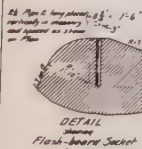
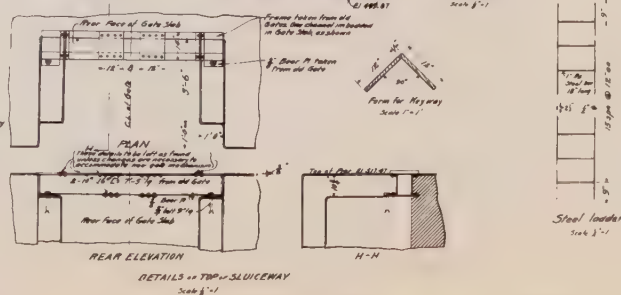
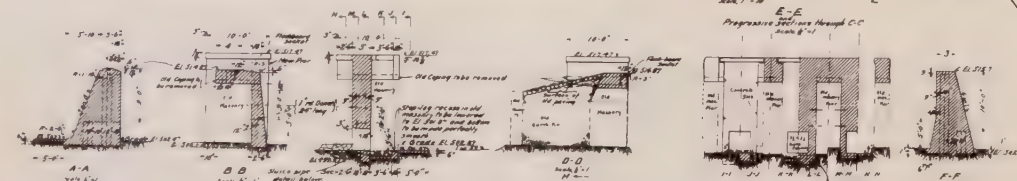
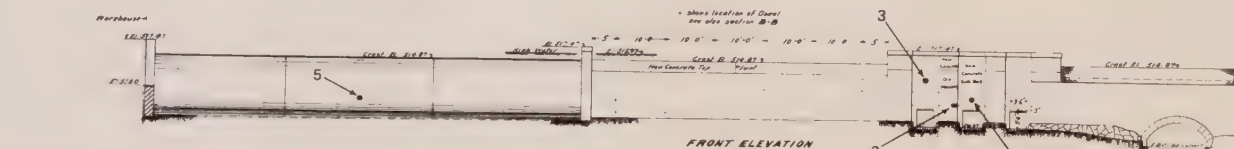
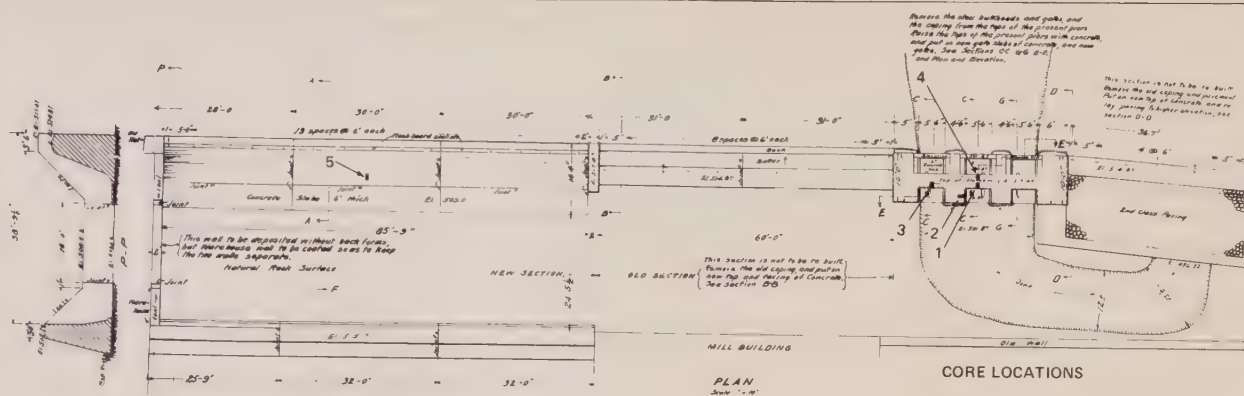


Culvert 125 Entrance at Lower Left, 18 Mile
Creek Culvert Exit in Center. (Note missing
lower left corner of arch.) Lockport Waste Gate

LOCKPORT WASTE GATE AND WEIR

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|---|---------------------|---------------------------|---------------------------|------------------------|--------------------|--|
| 1 | Waste Gate, South Side, Center of Middle Panel, 5½' Above Floor | 0 | 0 | 0 | 12" | 12" | Sounded solid, east panel same condition. |
| 2 | Waste Gate, Center Buttress, East Side, 4½' Above Floor | 0 | 6" | 0 | 10½" | 10½" | Sounded hollow, cored into limestone blocks. |
| 3 | Waste Gate, South Side, Center of West Panel, 5' From Top | 0 | 13" | 0 | 23" | 23" | Very hollow sounding. |
| 4 | Waste Gate, North (Canal) Side, Center of West Panel, 5' From Top | 0 | 3" | At 7" | 13" | 13" | Sounds solid. |
| 5 | Weir, South Side, Center of West Half, 3' From Bottom | 0 | 6" | At 6½" | 9½" | 9½" | Sounded hollow. |





1. All concrete for the structures shown on this sheet to be placed in Class Concrete.
2. Before depositing concrete upon old masonry or support, and before depositing concrete upon concrete, the surface shall be clean, dry and free of oil, dirt, mud, laitance, and other deleterious material, and the surface shall be thoroughly cleaned and roughened by sand blasting or other approved method.
3. Elevations of the bottoms of the structures shown herein shall be approximate only and they are to be placed at any elevation as may be required by the Engineer.
4. Elevation markings of completed structures are to be furnished by the Engineer. The elevations of the tops of the structures shall be as shown. Changes of levels to be returned to the Engineer in 1" increments.
5. Pipes for rectangular storm gutters and stormwater machinery, manholes, and other structures shall be placed and installed as specified by detail shown on a sheet of 18" x 18" and are to be installed in accordance with the following notes, details and standards:
 - a. Storm gutters shall be 24" long and are to be attached to the wing of the 18" x 18" pipe. The other end is to be attached to a down pipe.
 - b. Manholes shall be 24" in diameter.
 - c. One other leader, 18" in diameter, as shown.
 - d. Storm gutters shall be 12" high and 18" wide.
 - e. Storm gutters shall be 12" high and 18" wide. The top of the structure, together with the pipe shall be finished with the pipe.
 - f. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - g. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - h. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - i. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - j. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - k. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - l. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - m. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - n. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - o. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - p. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - q. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - r. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - s. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - t. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - u. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - v. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - w. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - x. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - y. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.
 - z. Storm gutters shall be 12" high and 18" wide. The top of the structure shall be finished with the pipe.

SEE CHANGES
PAGE 131

Contract No. 66.

Erie Canal Section X.

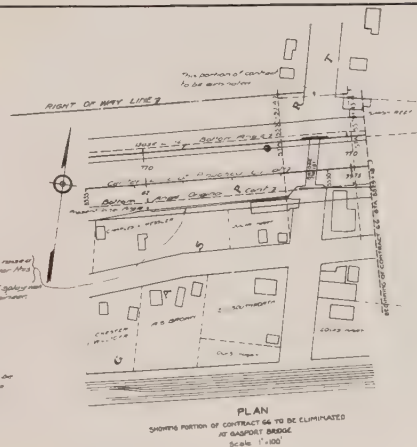
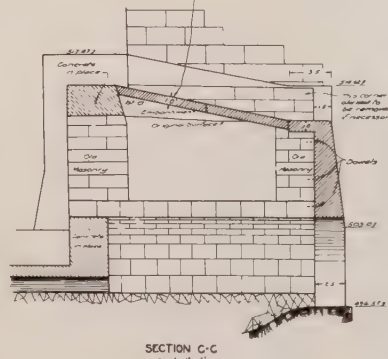
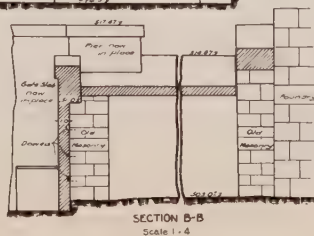
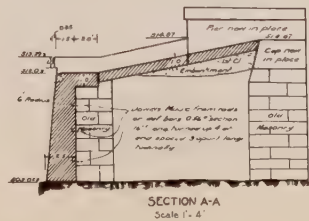
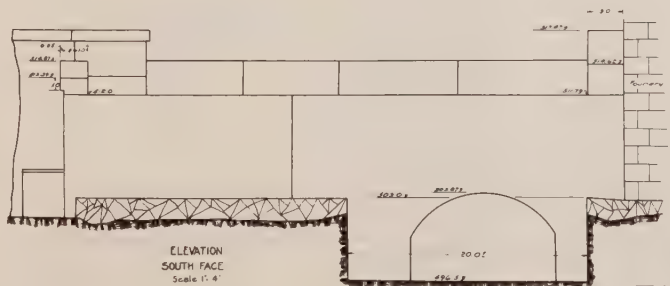
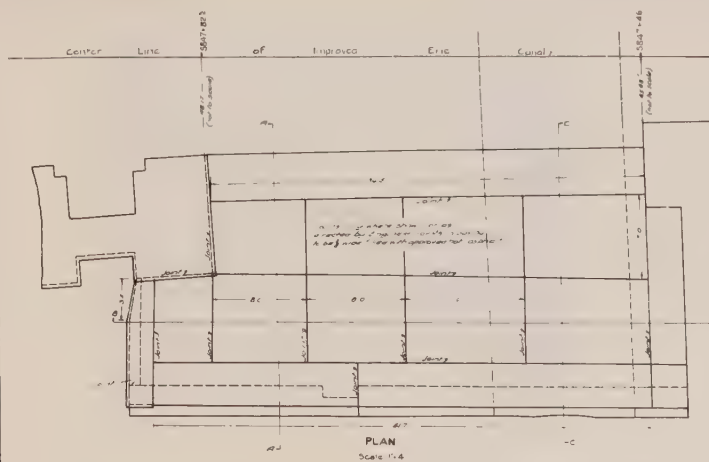
Between Gasport and Lockport
**DETAIL PLANS FOR WASTE WEIR
 AT LOCKPORT
 STA. 5849+00**

Scales as indicated

Examined and approved

Special Deputy State Engineer.

MADE BY Wm. F. F. 2-00
TRACED BY Wm. F. F. 3-00.
1st CHECK BY J. M. Taylor
2nd CHECK BY E. B. Bussing



MADE BY
TRACED BY *H. J. ... in Jan 1918*
1ST CHECK BY *... & ...*
2ND CHECK BY

Contract No. 66.
ALTERATION NO. 8
Erie Canal Section 10
**PLAN & DETAILS OF CHANGES AT
LOCKPORT WASTE WEIR & OTHER DETAILS**
Scale as indicated

Examined and approved
L. D. Alexander
Special Resident Engineer
January 24th

Examined and approved
January 21, 1911
Ally E. Hast
Special Deputy State Engineer

The original 1825 Erie Canal circled south around the gorge at Holley. The enlarged Erie Canal (1862) was constructed across the gorge on a high embankment and only the west branch of the canal leading to the Town of Holley was retained. Also, a stone masonry waste weir was constructed at the east end of the canal embankment.

Later, the Buffalo, Lockport and Rochester Electric Railway was constructed across the gorge on the south side of the canal embankment. This was accomplished by extending the south end of the Sandy Creek Culvert (Culvert #65) over 60 feet and widening the canal embankment.

On the west side of the gorge, the railway bridged over the west branch of the old Erie Canal branch into Holley. On the east side of the gorge, a large, concrete arch culvert, which still exists, was constructed under the railway to pass weir water down into the gorge. A short distance downstream of the culvert is a 50 foot waterfall. In 1976, a local organization appeared to be clearing the base of the canal embankment and turning the waterfall area into a small park.

In 1911, the Barge Canal was constructed in the same location as the enlarged Erie. A new waste weir was built at the east end of the south trough wall where the old weir existed. At the west end of the south trough wall, the Holley Spillway was built to also drain off excess canal water and feed it into the now abandoned Erie Canal branch into Holley. This spillway was recessed 16 feet further back than the south trough wall. Abandonment of the electric railway was proceeding at this time, so it did not conflict with Barge Canal construction.



Old Railway Culvert Next to Holley Weir



Holley Waterfall Downstream From Holley Weir

At Holley, the Barge Canal crosses a gorge created by the East Branch of Sandy Creek (Culvert #65) on a 83 foot high embankment. The 96 foot wide by 2040 foot long trough on this embankment was constructed under Contract 62 between 1911 and 1913.

Originally, the trough floor was designed as a double layer waterproofed slab, but this design was modified by Alteration #1 (Nov. 1911) as a result of the problems encountered at Bushnell Basin. Also, this alteration nearly doubled the original 1100 foot length of the trough.

On March 30, 1976, the trough was inspected and 4 cores were retrieved from the south wall. The center of the trough floor was covered with 6 inches of water and the sides were covered with mud up to 1 foot deep which prevented its complete inspection.

The north trough wall is composed of 40 panels plus the two end splaywalls. From east to west, the first 21 panels were in good condition with no detectable delaminations. On the 22nd panel, the east half was in good condition whereas the west half was 75% delaminated and contained a 3 inch wide by 6 inch deep by 7 foot long area of concrete scaling near the bottom of the wall. Between the 23rd and 40th panels, six panels contained no detectable delaminations, one panel was 50% delaminated, eleven contained between 5-20% of their surface area deteriorated and the west splaywall was 80% delaminated. Six additional areas of deep concrete scaling were seen on three panels. These scaled areas most likely have resulted from pockets of honeycombed (lack of consolidation) concrete.



Looking West from East End
Holley Trough



North Wall, Looking West from near East End
Holley Trough



Looking West, West End of North Wall
Holley Trough

The south wall is over 500 feet shorter than the north wall. At the west end of the south wall is the Holley Spillway and at the east end is the Holley Weir. East of the weir, the south side of the trough has a concrete slab lining the inside slope.

In 1919, under Contract 200, the top of the Holley Spillway was raised 3 feet with concrete to eliminate any water from flowing into the abandoned Erie Canal channel. This top 3 feet is now 100% delaminated while the spillway wall underneath is still in relatively good condition.

Perpendicular to the spillway is a corner wall which contained severe deterioration on the first 4 feet next to the spillway. The next 10 feet was estimated to be only 10% delaminated while the front of the corner wall (facing the canal, panel #1) contained no delaminations.

Of the 1st 18 panels of the south wall (from west to east), 8 contained no detectable delaminations, 5 were 30-50% delaminated, and 5 were 5-20% delaminated.

The eastern third of the south wall (panels #19-30) and the Holley Waste Gate and Weir were constructed with concrete containing crushed Medina sandstone coarse aggregate. These concrete areas generally appeared to be in poor condition. Although panel #19 contained no detectable delaminations, panels #20-30 contained major deterioration ranging from extensive delaminations to the top third of the wall falling into the canal. Some of these panels were too dangerous to walk under as the walls had cracked horizontally 3-6 feet below the top and moved inward about 1 foot. Depressions up to 3 feet deep existed in the embankment directly behind the wall. Previous concrete repairs and sections of the wall have fallen into the canal and other pieces were now loose and ready to fall.



East End of South Wall
Holley Trough



East End of South Wall
Top of Wall Falling Into Canal
Holley Trough



Looking East, East End of South Wall
Note depressions behind wall
Holley Trough

East of panel #30 is the Holley Waste Gate and Weir. East of the weir, the south slope was lined with a 12 inch thick concrete slab for 450 feet. The slab appeared to be in fair condition with open cracks and joints.

The 4 cores were all obtained from the south wall; 2 from gravel aggregate wall panels and 2 from Medina sandstone aggregate wall panels.

Cores #1 and 2 were taken approximately 120 feet and 250 feet west of the waste gate from sandstone aggregate wall panels. Both cores contained deterioration 20 inches deep. Although it contained 1 or 2 small fractures, the best section of Core #1 had a compressive strength of only 1680 p.s.i.

Core #3 and 4 were taken approximately 700 feet and 500 feet west of the waste gate from gravel aggregate wall panels. These cores contained deterioration only 5-6 inches deep. Core #4 had a compressive strength of 6265 p.s.i.

CONCLUSION

Generally, the north wall and the western two-thirds of the south wall were in good condition and contained only localized deterioration. The eastern third of the south wall contained wall areas of very extensive deterioration and repairs are needed.



South Wall, Two Types of Aggregates
Medina Sandstone on Left, Gravel on Right
Holley Trough



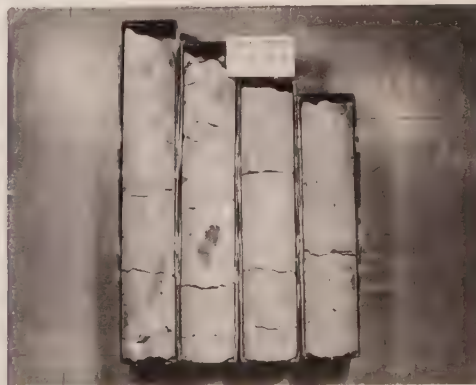
West Half of South Wall, Looking West
Holley Trough

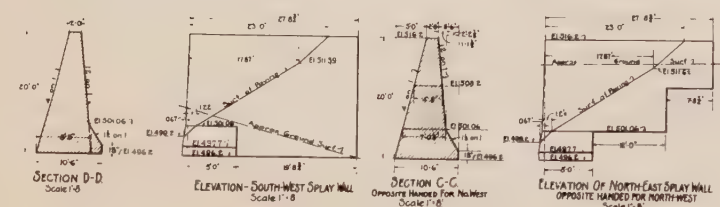
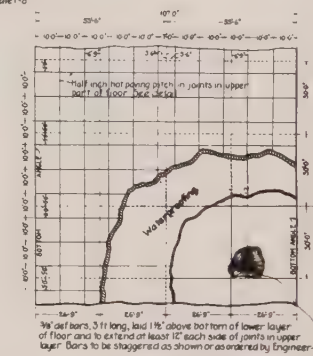
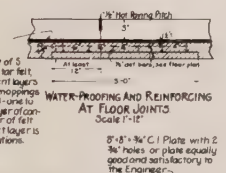
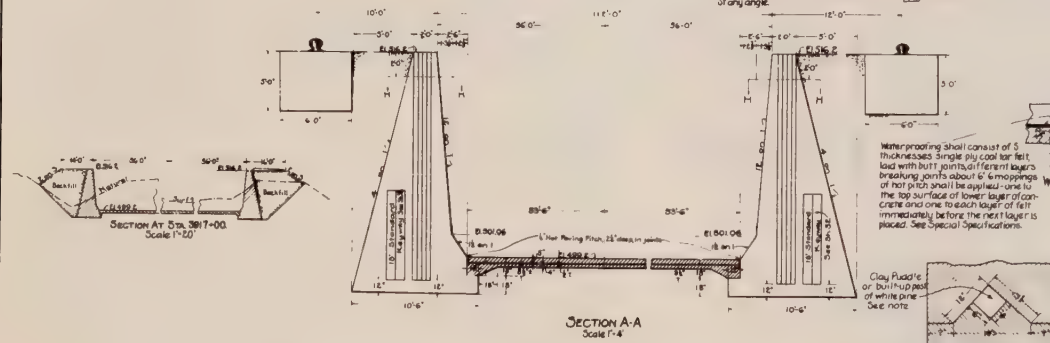
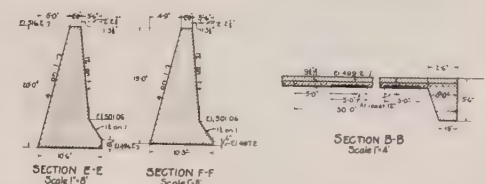
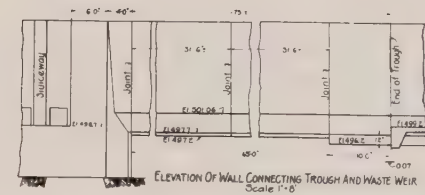
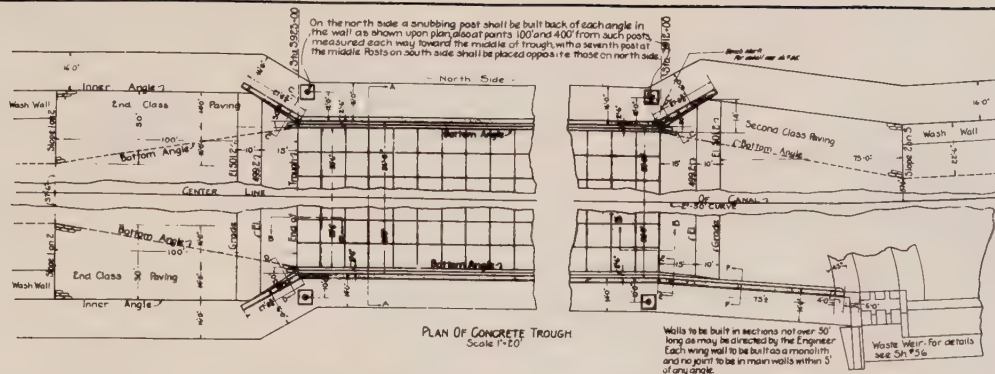


Holley Spillway at West End of South Wall
Note 3 foot cap on top of old spillway
Holley Trough

HOLLEY TROUGH

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|---|---------------------|---------------------------|---------------------------|------------------------|--------------------|---|
| 1 | South Wall, 120' West of Waste Gate, 4' From Bottom | 1/2" | 20" | At 12" | 23" | 23½" | Hollow sounding area. |
| 2 | South Wall, 250' West of Waste Gate, 4' From Bottom | 1/4" | 20" | At 12" and 16" | 22" | 22" | Hollow sounding area. |
| 3 | South Wall, 700' West of Waste Gate, 4' From Bottom | 0 | 6" | At 13" | 19½" | 19½" | Wall looked good. Some deep scaling at top of wall. |
| 4 | South Wall, 500' West of Waste Gate, 4' From Bottom | 0 | 5" | At 7" | 18" | 18" | Wall looked good. |





NOTES

The concrete in retaining walls and floor is to be paid for as Second Class Concrete. The metal reinforcement is to be paid for separately.

The material under the floor of the trough is to be thoroughly compacted before concrete is deposited. All unsuitable material is to be removed and replaced by material satisfactory to the Engineer.

All exposed edges of concrete to be rounded to radius of 3" unless otherwise noted.

The 6"x6" recesses of joints to be filled with clay puddle or built-up wooden post of white pine as ordered by the Engineer. See Special Specifications.

Exact limits of paving are to be determined by the Engineer.

The bases of structure shown on this plan are approximate only and may be ordered by the Engineer to best advantage or of any dimensions necessary for a proper foundation.

SEE CHANGES
PAGE 138

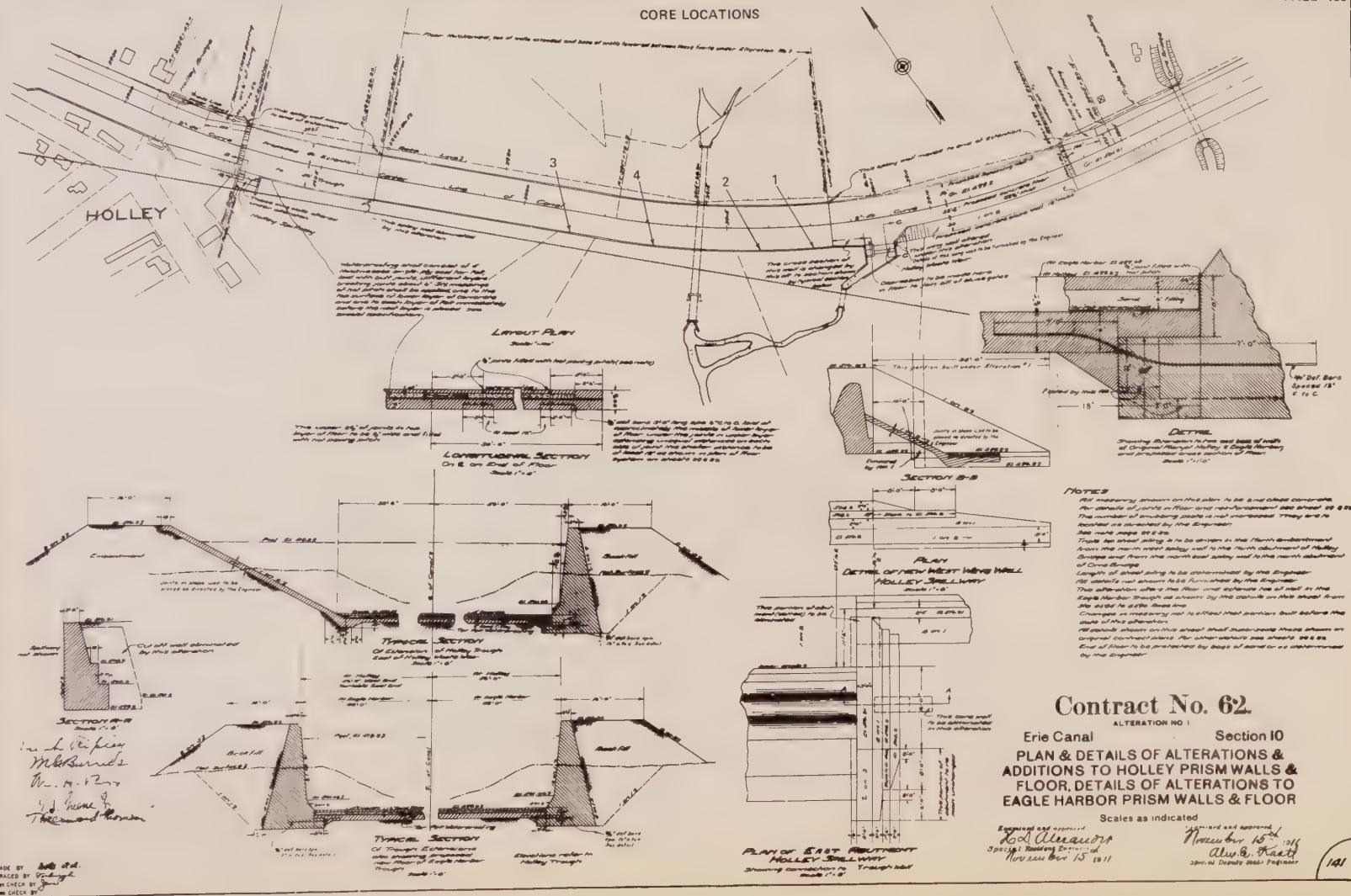
Contract No. 62.

Erie Canal Section 10
Between west line of Monroe County and Eagle Harbor.
EAST OF HOLLEY,
STA. 3912 TO STA. 3923
Scales as indicated

MADE BY
TRACED BY
1ST CHECK BY
2ND CHECK BY

Examined and approved
Mech. 7, 1910
L. W. J. Caudwell
Special Insp. (U.S. State Engineer)

CORE LOCATIONS



Contract No. 62

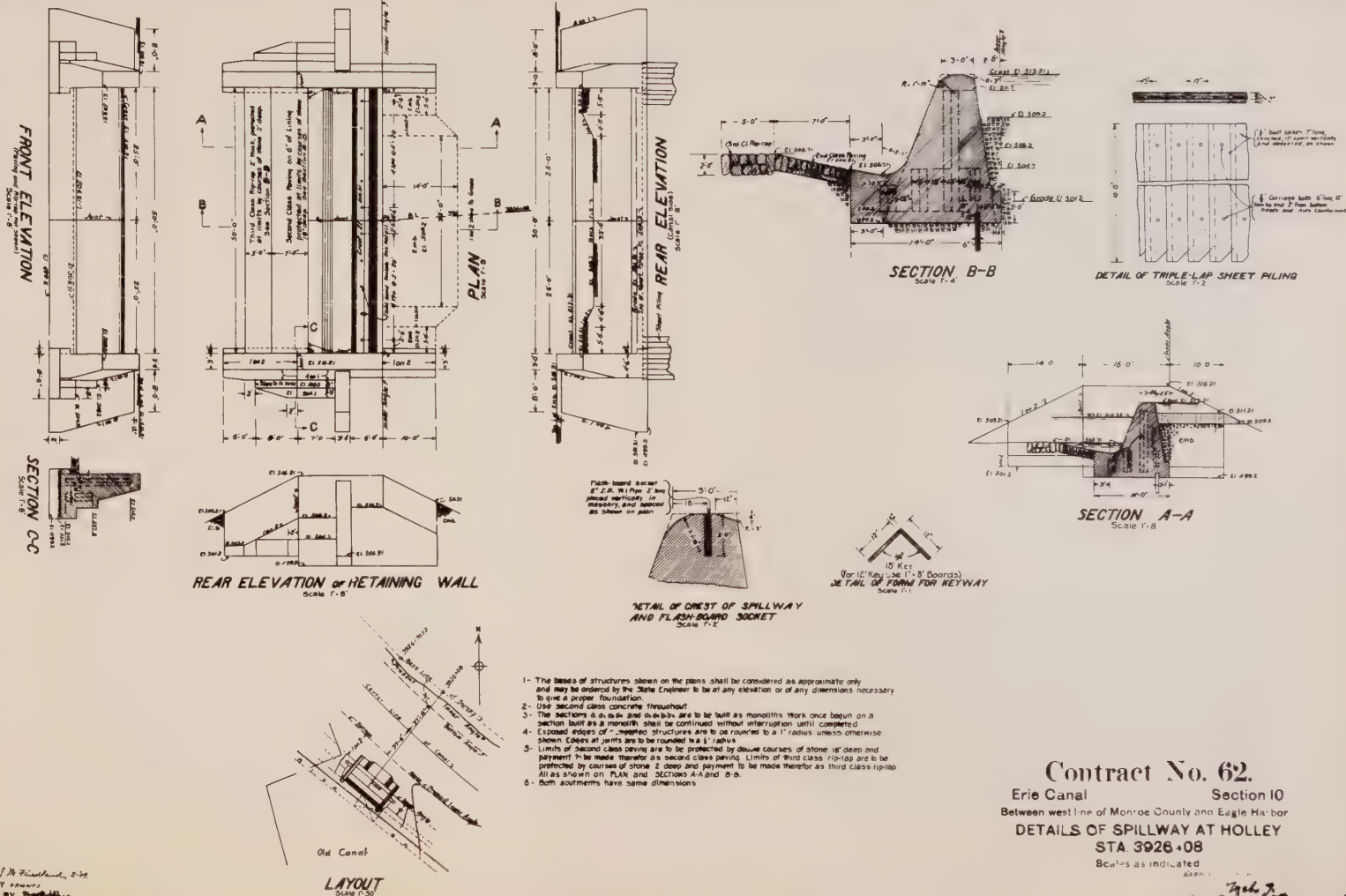
ALTERATION NO. 1

Erie Canal Section 10
 PLAN & DETAILS OF ALTERATIONS &
 ADDITIONS TO HOLLEY PRISM WALLS &
 FLOOR, DETAILS OF ALTERATIONS TO
 EAGLE HARBOR PRISM WALLS & FLOOR

Scales as indicated

Designed and prepared by
 J. B. Burt
 Engineer
 November 15, 1911
 Checked by
 J. B. Burt
 November 15, 1911
 Prepared and approved by
 J. B. Burt
 November 15, 1911
 Checked by
 J. B. Burt
 November 15, 1911
 Prepared and approved by
 J. B. Burt
 November 15, 1911
 Checked by
 J. B. Burt
 November 15, 1911

MADE BY
 TRACED BY
 IN CHECK BY
 IN CHECK BY



- 1- The bases of structures shown on the plans shall be considered as approximate only and may be ordered by the State Engineer to be at any elevation or of any dimensions necessary to give a proper foundation.
- 2- Use second class concrete throughout.
- 3- The sections A-A and B-B are to be built as monoliths. Work once begun on a section built as a monolith shall be continued without interruption until completed.
- 4- Exposed edges of all masonry structures are to be rounded to a 1" radius unless otherwise shown. Corners at joints are to be rounded to a 3" radius.
- 5- Limits of second class riprap are to be protected by double courses of stone if deep and payment is to be made therefor as second class riprap. Limits of third class riprap are to be protected by courses of stone 2' deep and payment is to be made therefor as third class riprap. All as shown on PLAN and SECTIONS A-A and B-B.
- 6- Both abutments have same dimensions.

Just west of Albion, the Barge Canal is carried across the 60 foot high embankment over Otter Creek (Culvert #86) in a concrete trough. Constructed between 1911 and 1913 under Contract 62, the trough is 96 feet wide and 500 feet long.

The original floor of the trough was designed as a double layer waterproofed slab, but this design was modified under Alteration #1 (Nov. 1911) as a result of the problems encountered at Bushnell Basin.

On April 1, 1976, the trough was inspected. At this time, the center of the trough floor was covered with 6 inches of water and the sides were covered with mud up to 2 feet deep which prevented its complete inspection.

The majority of both the north and south walls appeared to be in good condition with only a few small areas of scaling. However, the top 2 feet of the walls did contain some cracks and scaled areas. Of the sixteen 30 foot long panels on each wall, only seven panels on each wall contained areas of efflorescent covered cracks. When tapped with a hammer, however, most of these panels did not sound delaminated as the cracks were still very tight.

On the north wall, 1 of the 2 splaywalls at both ends sounded



North Wall, Looking East
Eagle Harbor Trough



North Wall, Looking West
Note sheet piling protruding above water.
Eagle Harbor Trough

approximately 40% delaminated. The east corner of the north wall also contained a large spall. Deterioration at this location may have been initiated by a barge hitting the corner area.

On the south wall, the surface area of one panel was estimated to be 10% delaminated and six others were 5% or less. At the east end, the corner splaywall had vertical cracks at the third points and the adjacent wall panel had a vertical crack at the center.

At the west end of the south wall, the first section of splaywall and the corner splaywall had horizontal cracks at mid-height and below. A vertical crack, which was about 1/2 inch wide at the bottom, existed on the first section of wall and the second panel had a wide horizontal crack near the top of the wall which had been patched. The third panel had a 3 foot by 1 foot wide spall in the upper left corner and all except the first section of splaywall were anchored into the embankment. Notches in the wall indicated that timber supports or braces had been used to temporarily hold up this section of wall while repairs were made. One of these timber supports was still intact. Steel rods near the top of the wall now seemed to anchor it into the embankment. Also, timbers were buried in the mud along the wall and this wall section was out of alignment by over 8 inches.



South Wall, Looking West
Eagle Harbor Trough



South Wall, Looking East
Eagle Harbor Trough

What was of present concern, however, was a 1 foot wide by 10 foot long hole which extended under the corner splaywall. In front of this splaywall, the trough floor (covered with water) had dropped over 2 feet lower than that at the center of the trough. Although both ends of the trough had been sheetpiled, no sheetpiling was seen behind the walls and there was the possibility that water could be leaking under the wall or down through the floor and out the embankment. An inspection of the embankment in this area revealed no sign of any past or present leakage.

Since no one knew when or what had actually occurred at Eagle Harbor, a search of the old reports was begun. In a 1927 Superintendent of Public Works Report, the following was found:

Break at Eagle Harbor

"In the afternoon of August 3, 1927, a break occurred in the canal bank near Eagle Harbor. At this location the canal is carried in a concrete trough resting on a high earth fill across a ravine. The nearest guard gates were closed as soon as possible, but the water rushed through the crevasse and tore out a large section of the bank and a considerable portion of the concrete trough. The culvert underneath the embankment was soon filled with stones, silt and other material to such an extent that the flow of water was practically stopped. The canal water formed a lake on the south side of the canal about $2\frac{1}{2}$ miles long and in places was more than 50 feet deep. Because of the plugged culvert it was four days before the water in the canal was sufficiently lowered so that the bottom was exposed. Plans were made for the immediate assembling on the job of all available Department personnel and equipment. The Highway division placed at our disposal all men and equipment in the vicinity and this help was most valuable and in addition contractors' plant was hired.



Southwest Corner, Area of 1927 Failure
Eagle Harbor Trough



Southwest Corner, Note anchor bolt heads 2 feet below top of wall and large hole under corner wall. Water covered floor drops 2 feet by sheet piling.



Looking East along South Wall from West End
Note inward movement of wall in foreground

In order to reach the site of the break it was necessary to build a bridge across a nearby spillway for trucks and equipment. To give a means of access for trucks, pile drivers and other equipment to the canal bed, an inclined timber trestle was built from the canal bank down to the trough. Several timber turnouts for trucks were built. To restore the earth embankment lying back of the side wall and to fill up the hole beneath the floor of the trough, required the replacement of approximately 25,000 cubic yards of material, which was entirely placed within nine working days.

To hold the new bank, two parallel rows of steel sheet piling were driven through the new fill and continued well into the stable banks on each side. Cut-off walls of steel sheet piling were also driven across the canal bed at both ends of the concrete trough in order to prevent future undermining. The concrete side wall had not gone out and this was shored up by heavy timbering. The hole in the bottom of the canal was sealed with a clay puddle.

During the repair work persistent efforts were made to open the culvert under the canal by the use of explosives, excavators, drag lines, etc., but the culvert still remained plugged after the work was completed and water turned back into the canal.

The canal was refilled and the first boat passed over the break at 3:30 A.M., August 22nd. This was a difficult repair job and was carried out most efficiently and in the shortest possible time. Work was carried on night and day and the Department organization functioned especially well. Competent observers on first seeing the break said it could not possibly be repaired in less than six weeks' time, but it was actually done in less than half that time."

Also, in the 1928 Report, the following additional information was found:

"The temporary repairs made to restore navigation following the break at Eagle Harbor last year included diagonal braces in front of the trough walls. These braces obstructed navigation in the south half of the channel. During the period when the Sixty-Mile Level was unwatered for the annual spring inspection and cleaning of the prism, the wall was underpinned by placing steel beams supported on timber piles and the diagonal braces were removed."

Since no mention was made of the anchoring system, this work must have been done later. The anchor rods were located about 2 feet below the tops of the wall and were undoubtedly attached to the sheetpiling driven behind the walls in the embankment. Presently, however, the ends of some of the anchor rods have rusted so seriously that the anchor rod heads have fallen off.

During the week of April 19, 1976, the hole under the corner splaywall was filled with concrete by Canal Maintenance Forces.

On April 29, 1976, two cores were taken from south wall panels that sounded solid, but contained efflorescent covered cracks. Core #1, from the 6th, and Core #2 from the 4th wall panel from the west corner splaywall, both contained very tight cracks up to 1 foot deep into the wall.

CONCLUSION

The Eagle Harbor Trough still is in good condition, except for the area that failed in 1927. As the anchor rod heads fall off, this short section of wall could start moving inward due to soil pressure behind the wall and the presence of more voids underneath or an unstable foundation. This area needs watching and possible repairs.

EAGLE HARBOR TROUGH

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|--|---------------------|---------------------------|---------------------------|------------------------|--------------------|---|
| 1 | South Wall, Middle of 6th Panel From West End, 4' Above Ground | 0 | 6" | 0 | 15" | 15" | Small cracks covered with efflorescence, solid sounding area. |
| 2 | South Wall, 4th Panel From West End, 10' From East End of Panel, 4' Above Ground | 0 | 10" | At 16" | 21½" | 21½" | Small cracks covered with efflorescence, solid sounding area. |



The Medina High Wall forms the majority of the north side of the trough at Medina. It extends from the Medina Aqueduct (Culvert 99) westward 1614 feet along the Oak Orchard Creek Gorge. Wall height varies from 25 to 35 feet and it is composed of massive concrete monoliths 21 to 28 feet wide at the bottom which taper up toward the top. The top of the north wall widens out to form the towpath roadway. All monoliths are keyed into bedrock.

On the south side, a 260 foot long section of the high wall exists between Culvert 99 on the east end and the Medina Waste Weir at the west end.

Between the trough walls, the canal has been backfilled with stone rubble to within 14 feet of the wall top.

East of Culvert 99 and west of Oak Orchard Creek Gorge, the canal is confined by concrete retaining walls, and these walls have wide earth fill areas behind them. No attempt was made to inspect these walls other than to note that they appeared to be in the same general condition as the inside faces of the trough walls.



Looking East Across Oak Orchard Creek Gorge
North Wall of Medina Trough and Culvert 99
exit on right. Oak Orchard Creek Waterfall
at left center.



Looking West Along North Trough Wall
Culvert 99 Exit at bottom left and Medina
Falls at right.



North Side of Trough Wall West of Culvert 99
Surface cracked and stained. West of this
area, the north wall is mostly obscured by
trees and underbrush.

The north face of the north high wall was sounded along the bottom, but only small areas of deterioration were found. One small leak was also found at a construction joint near the center of the north wall. Most of the deterioration on the outside faces of both high walls consisted of surface scaling. The concrete towpath roadway and the railing on top of the north wall were in generally good condition.

The inside wall faces also appeared in good condition, but nearly all wall panels had 1 or more long, narrow areas of up to 1 foot deep scaling. These areas followed horizontal construction joints or cold construction joint lines on the walls. Due to the generally sound appearance and massiveness of the high walls, no cores were taken.

CONCLUSION

Except for pockets of scaling on the insides of the trough walls and surface scaling on the outsides, the walls appeared to be in good condition. No repairs other than to possibly small areas of deterioration are anticipated. However, most wall surface areas could use a durable cosmetic treatment to eliminate the unsightly scalings.



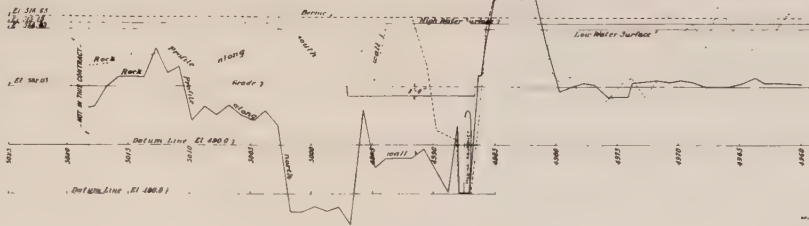
Looking West Along South Trough Wall
Culvert 99 Entrance at bottom of wall. Surface cracked and stained.



South Face of Trough North Wall
Horizontal deep scale areas and joint lines along wall. Medina Harbor at left. Medina Gorge beyond wall on right.



Looking East From Medina Harbor
Medina Weir and Waste Gate on right. Note deep scale areas along both walls.



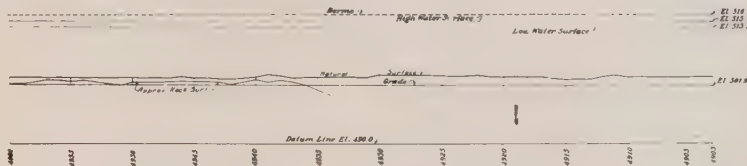
PROFILE ALONG NORTH AND SOUTH WALL.

SCALE 1" = 400'



LAYOUT PLAN OF CONTRACT.

SCALE 1" = 300'



PROFILE ON CENTER LINE OF CANAL.

SCALE 1" = 400'

VERT 1" = 10'

Contract No. 65. Erie Canal Section 10

AT MEDINA
LOCATION MAP & PROFILE

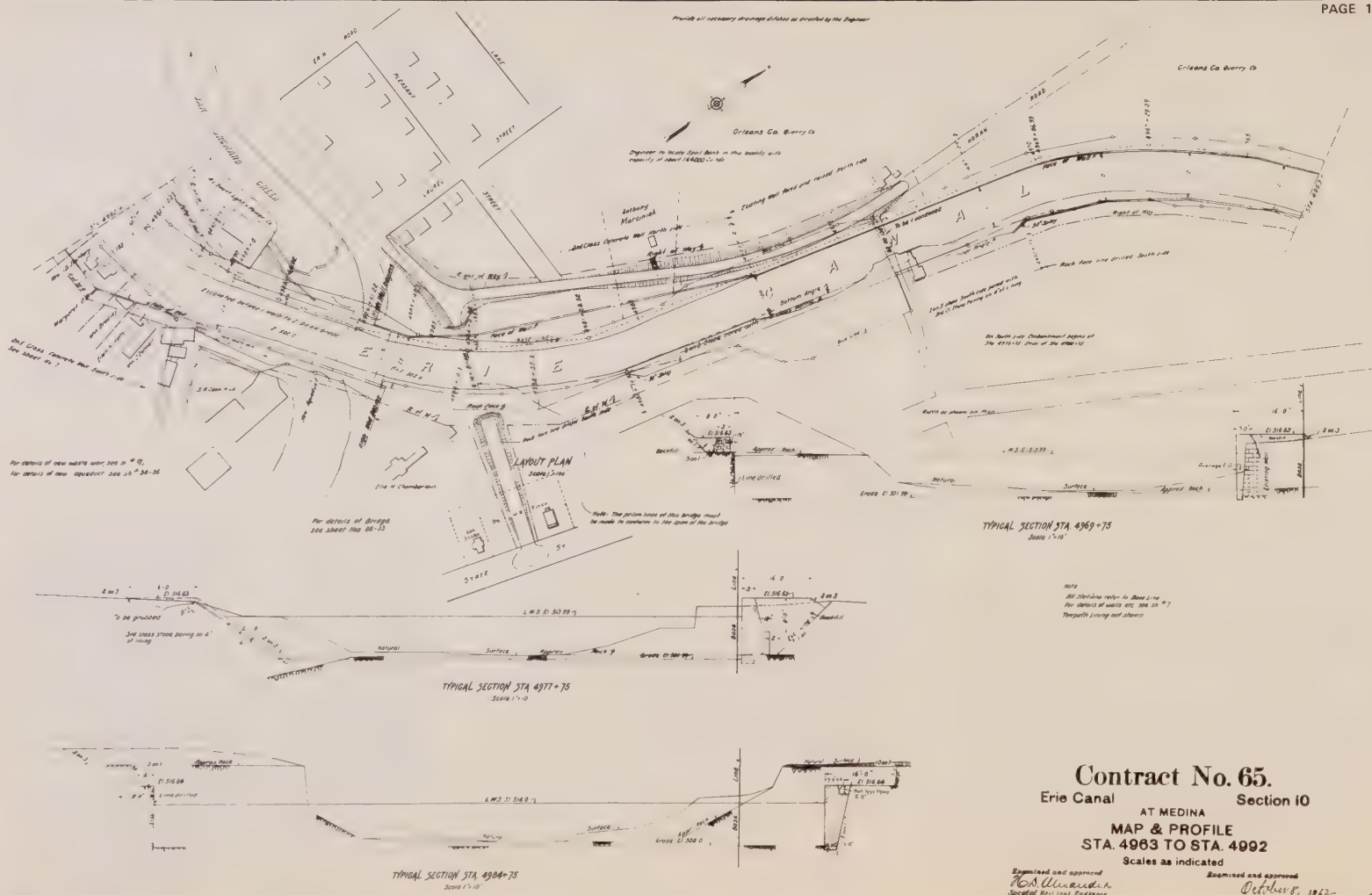
Scales as indicated

Prepared by
J. S. Alexander
Surveyor
OSWEGO, N. Y.

Examined and approved

October 1, 1912
Alfred C. Kott
App. and Deputy State Engineer.

Provide all necessary drainage facilities as directed by the Engineer.



Contract No. 65.
Erie Canal **AT MEDINA** **Section 10**
MAP & PROFILE
STA. 4963 TO STA. 4992
 Scales as indicated

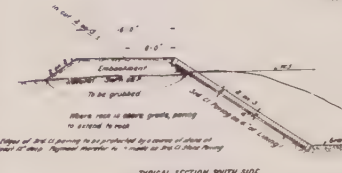
Examined and approved
Edw. A. ...
 District Engineer
 1912

Examined and approved
Edw. A. ...
 Special Deputy State Engineer.

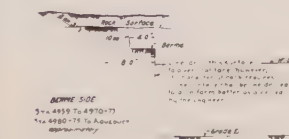
Mass B. ...
 1912



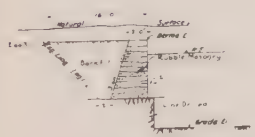
TYPICAL PRISM SECTION IN EARTH
WHERE ROCK IS AT OR ABOVE GRADE MAINTAIN WALL TO EXTEND TO ROCK
Scale 1"=8'



TYPICAL SECTION SOUTH SIDE
STA 4970+35 TO 4980+75
Scale 1"=8'



TYPICAL SECTIONS
ROCK ABOVE BERM
Scale 1"=8'

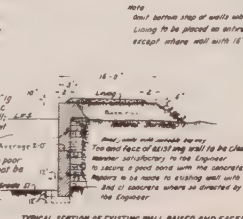


TYPICAL SECTIONS
ROCK BELOW BERM
Scale 1"=8'

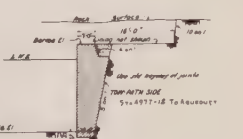
Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.

Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.

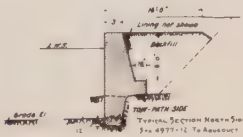
Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
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3. Edges of joints to be rounded to a 3/8" radius.



TYPICAL SECTION OF EXISTING WALL RAISED AND FACED
NORTH SIDE STA 4945+00 TO 4977+16
Scale 1"=8'
(Use Dotted Bas On Exts.)



TYPICAL SECTIONS
ROCK ABOVE BERM
Scale 1"=8'



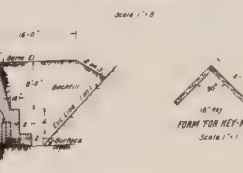
TYPICAL SECTIONS
ROCK BELOW BERM
Scale 1"=8'

Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.

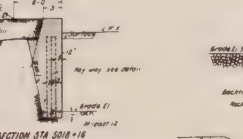
Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.



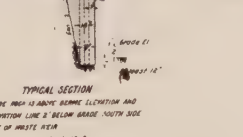
TYPICAL SECTION ROCK BELOW GRADE
NORTH SIDE STA 5002+35 TO 5018+60
Scale 1"=8'



TYPICAL SECTION ROCK 2 FT OR LESS ABOVE GRADE
NORTH SIDE STA 5002+35 TO 5018+60
Scale 1"=8'



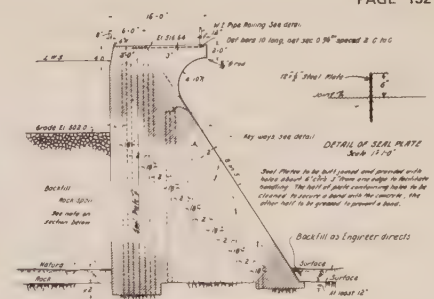
TYPICAL SECTION STA 5018+16
Scale 1"=8'



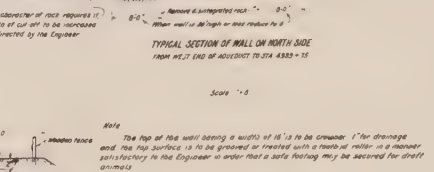
TYPICAL SECTION
WHERE ROCK IS ABOVE BERM LOCATION AND
ELEVATION LINE IS BEYOND GRADE SOUTH SIDE
WEST OF BRIDGE PIER
Scale 1"=8'

Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.

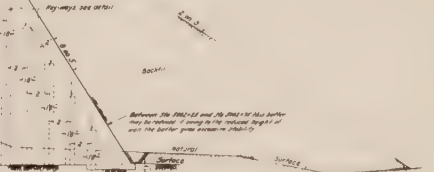
Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.



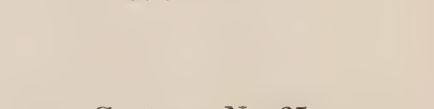
TYPICAL SECTION OF WALL ON NORTH SIDE
FROM WEST END OF ADJUTORY TO STA 4980+35
Scale 1"=8'



Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.



TYPICAL SECTION OF WALL ON NORTH SIDE
STA 4990+35 TO STA 5002+35
Scale 1"=8'



TYPICAL SECTIONS
ROCK ABOVE BERM
Scale 1"=8'

Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.

Notes:
1. Masonry shown on this plan is to be carried as Second Class Concrete unless otherwise indicated.
2. Exposed edges of concrete to be rounded to a radius of 3" unless otherwise shown.
3. Edges of joints to be rounded to a 3/8" radius.

Contract No. 65.

Erie Canal Section 10

AT MEDINA

CROSS SECTIONS OF PRISM WALLS

Scales as indicated

Examined and approved
Special Assistant Engineer
C. H. P. Smith
1917

Examined and approved
Assistant Deputy State Engineer
C. H. P. Smith
1917

MADE BY
TRACED BY
BY CHECK BY
AND CORRECT BY

DETAIL OF WOODEN FENCE
Scale 1"=8'

DETAIL OF PIPE RAILING
Scale 1"=8'

LOCKS AT LOCKPORT

Prior to construction of the Barge Canal, two flights of locks, each consisting of 5 locks, existed at Lockport. Under Contract 67 (1910 - 1913), the south flight was removed and Locks 34 and 35 were constructed in tandem. Lock 34 has a lift of 24.6 feet and Lock 35 has a lift of 24.5 feet (total lift is 49.1 feet). Both locks rest on bedrock in a narrow excavated gorge.

Due to verbal reports of the rock gorge slowly moving back together and causing cracks and lock floor buckling, an inspection was made on April 1, 1976. At this time, the floor of Lock 35 was nearly free of ice and water as it drains into Lock 34. Unless pumped out, the floor of Lock 34 can not be inspected as it is always covered with a few feet of water.

The floor of Lock 35 appeared to have buckled from extreme pressures. Concrete slabs were cracked and tilted throughout. Some slabs were nearly 2 feet above others and numerous 1 foot deep holes existed. Also, it appeared that some damage had been caused by extreme turbulence on the lock floor. At a few of the port openings, 8 foot square concrete pads had been placed in the concrete floor. According to Region personnel, the floor of Lock 34 is similar to Lock 35.

Inspection of Contract 67 plans revealed that the original design of the lock floor was for 8 foot wide by 10 foot long by 2 foot thick concrete pads or aprons to be placed at the exit of each port. However, if the bedrock was "soft", the contractor was to extend the aprons as directed by the State Engineer.

According to a note on Alteration #2 (March 1913) plans, the contractor placed a 2 foot thick concrete floor throughout Lock 35. This brought the lock floor to elevation 525.0 or approximately 1.5 feet below the port openings.

Soon after completion of Contract 67, cracks and other deterioration began in the Lock 35 upper gate area. By 1917, major repairs were needed and contract plans were completed. Possibly as a result of indecision as to what was causing the problems and the proper corrective action, these plans were twice revised. Finally, on November 15, 1919, Contract 152 was awarded and all work was completed by May 10, 1920.

The 1920 State Engineer's Report contained the following description of this problem:

"Since first being in use, the upper end of the tandem locks at Lockport had shown some deterioration, evidently due to the action of water in the vertical drop through the feed culvert back of the upper valves. In order to prevent a possible failure during the navigation season, the upper breast wall and about 200 feet of the lock walls were removed and rebuilt of heavier section and the drop in the feed culvert was placed in front of the valves."

Soon afterwards, additional cracks and problems developed in the locks. In 1925, survey stations were set along both locks and at 5 foot height intervals on the walls. The distance between the vertical lock walls was then accurately measured at over 100 points.

The average distance between the Lock 35 walls was found to be 44.5 feet. As the lock walls were originally constructed 45.0 feet apart, this meant the walls were now 0.5 foot closer together. Between 1925 and 1969 (latest data), the walls moved together another 0.3 foot for a total of 0.8 foot.

Lock 34 differs from Lock 35 in that the eastern end is not in a rock cut. The western end of Lock 34 was found to be approximately 0.4 foot less in width than originally constructed whereas the eastern end was only 0.15 foot less. Between 1925 and 1948 (latest data), the western end moved an additional 0.15 foot while the eastern end moved only 0.05 foot.

This phenomenon of rock cut walls moving closer together has only recently been completely understood. Basically, the deep rock cut provides a place where built-up stress within the rock can be relieved. The most relief or movement occurs soon after the cut is made, but it continues at a decreasing rate indefinitely.

Since 1920, periodic repairs have been made to the lock sills and other areas as cracks and other problems developed.

Lock 35 is the only lock with a double set of doors and no buffer beam to prevent Canal traffic from damaging the doors. (Buffer beams are no longer used.) The apparent reason for this is a fluctuating water level. East of Lock 35, the canal water level is controlled by man and only small variations are possible. West of Lock 35, the water level is primarily controlled by the height of the Niagara River which is fed from Lake Erie. Past history indicated wide fluctuations in the Niagara River due to unusual weather conditions. Strong easterly winds blowing across Lake Erie push the lake water westward and cause the Niagara River to drop. (The 1933 State Engineer's Report stated that Niagara Falls actually stopped flowing on November 5 due to these unusual winds.) If west winds cause the water to rise, the Pendleton Guard Gate is lowered to protect the Locks at Lockport.

A low water level would allow some early 1900 type barges to pass underneath a buffer beam and hit the lock doors. By constructing a set of outer doors, the inner doors would always be protected. By making the outer doors watertight, they could also serve other functions.

During our initial inspection on February 18, 1976, the walls of Locks 35 and 34 in Lockport appeared in much better condition than those previously evaluated at Locks 33 and 32 in Rochester. As the Lock 34 walls contained only a few small, isolated scaled areas and were obviously still in good condition, no plans were made for any further evaluation of this lock. Lock 35, however, did contain areas of deep deterioration.

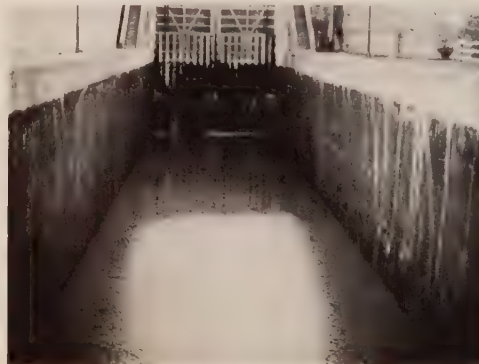
Although the floors of both locks have buckled as previously noted, the concrete slabs present no hazard as long as they do not protrude high enough to be struck by canal traffic.



Lock 34 - Looking East



South Wall of Lock 34



Lock 34 - Looking West
Lock 35 doors in background



North Wall of Lock 34

The deterioration on the Lock 35 walls appeared to be concentrated in isolated sections. On the south wall, the majority of the deterioration was on the 2 wall panels at the west end of the lock. This section was rebuilt in 1920 under Contract 152. Another area of deep scaling had occurred near the bottom at the east end, where the wall is recessed to receive the opened lock door. The remainder of the south lock wall contained only a few scattered scaled areas. These areas of deterioration were in the vicinity of either cold or lift joints on the concrete walls.

On the north lock wall, the western half contained the most deterioration. It was difficult to distinguish a difference between



Looking West - Lock 35 Buckled Floor



South Lock Wall - Lock 35, Looking East
Note lack of extensive deterioration



South Lock Wall - Lock 35, Looking West
Note deterioration at west end and buckled floor.



West End of South Lock Wall - Lock 35
Deteriorated areas were rebuilt in 1920

the 3 wall panels at the west end that were rebuilt in 1920 and the adjacent original 1912 section. The east half of the north wall contained only a few scattered scaled areas, and all of these deteriorated areas followed joint lines on the concrete walls.

Between the 2 sets of upper lock doors, the concrete walls have scaled over most of their surface area. These walls were also rebuilt in 1920. Some recent repairs have been made along the top of these walls.



West End of North Wall - Lock 35
Block 68 located in center of photo. Note cracks and repair failures. This area was rebuilt in 1920.



North Wall Between Upper Lock Doors



South Wall Between Upper Lock Doors

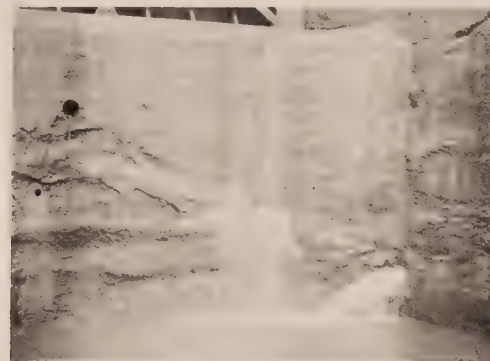


North Wall - Lock 35
Note change in surface deterioration halfway along wall

The remains of grout or shotcrete repairs can still be seen clinging to some of the deeper scaled areas next to and on block #68 at the western end of the north lock wall. These repairs may have been made under Contract 152 (Alteration #1) in 1920, but they most likely are of a more recent vintage. Since 1920, repairs have also been made on the concrete sills at both ends of the lock by Canal Maintenance Personnel.

On September 22, 1976, five cores were obtained from the western end of Lock 35 where the majority of the deterioration existed. Core #3 was taken from the concrete sill below the recently repaired top. This 1920 rebuilt area contained deterioration 11 inches deep and the bottom section of the core had a compressive strength of 5915 p.s.i.

On the south lock wall, Core #4, from the 1920 rebuilt area, contained deterioration 14 inches deep, with the outermost 7 inches previously scaled away. Core #5, from a typical 1912 concrete wall area, contained deterioration 8 inches deep. Since both the rebuilt (1920) and the original wall areas contain concrete with gravel aggregate, the difference in deterioration is probably due to slight changes in the concrete mixture and/or construction procedures.



West Sill of Lock 35
Note core hole at left center (upper hole is drain) and leak through lock wall at right.



Sill at West End of Lock 34

On the north lock wall, Core #1 was taken in the upper west corner just above the high water level mark. This 1920 rebuilt area contained deterioration only 3 inches deep. Core #2, 27½ inches long, was taken in a 6 inch deep scaled area where the surrounding concrete contained partially missing repair patches. This core was obtained along either a horizontal cold joint or crack, which had filled in with mineral deposits. The last 6 inch section of this core was limestone block. (Limestone blocks from the previous Erie Canal lock walls were probably used as fillers for the new Barge Canal concrete lock walls).

The area represented by Core #2 was block #68, supposedly rebuilt in 1920 under Contract 152 (Alteration #1). However, other rebuilt areas contained gravel coarse aggregate concrete while Core #2 contained concrete with crushed limestone coarse aggregate. This may indicate that block #68 was not rebuilt as shown on the contract plans, but only repaired. Therefore, Core #2 probably represents the original 1912 construction.

Although no additional cores were taken from the north lock wall, the west half (except for the 1920 rebuilt west corner) appeared to contain concrete with crushed stone aggregate. The concrete performance contrast between the gravel aggregate concrete used in the east half and the crushed stone aggregate used in the west half was very apparent at the vertical joint between port holes #4 and 5 (from eastern end of lock).



Block 68 - Lock 35
Area of Core #2. Note core hole.



Joint Near Middle of Lock 35 North Wall
Crushed limestone aggregate concrete on left. Gravel aggregate on right.

Conclusion

The reason for the apparent differences in deterioration within Lock 35 and between Lock 35 and Lock 34 is not presently known. However, Lock 34 is still in relatively good condition and only isolated repairs are needed. Lock 35 contains isolated areas of deep scaling and delaminations. The majority of the deterioration is presently contained within 15 inches of the original surface. Due to the thickness of the massive lock walls, this noted deterioration is a surface condition which detracts only from the aesthetic value of the structure. Areas of deeper deterioration exist in the area of block #68 and in other small isolated areas which can only be located as future repairs are made. Open vertical joints in the lock walls should also be sealed to prevent leakage into and out of the lock.



East End of Lock 34 and Erie Lock 67
Note wood floor under stone block lock



Buckled Floor of Lock 35
Note scaling at right of southeast door
and broken floor slabs.

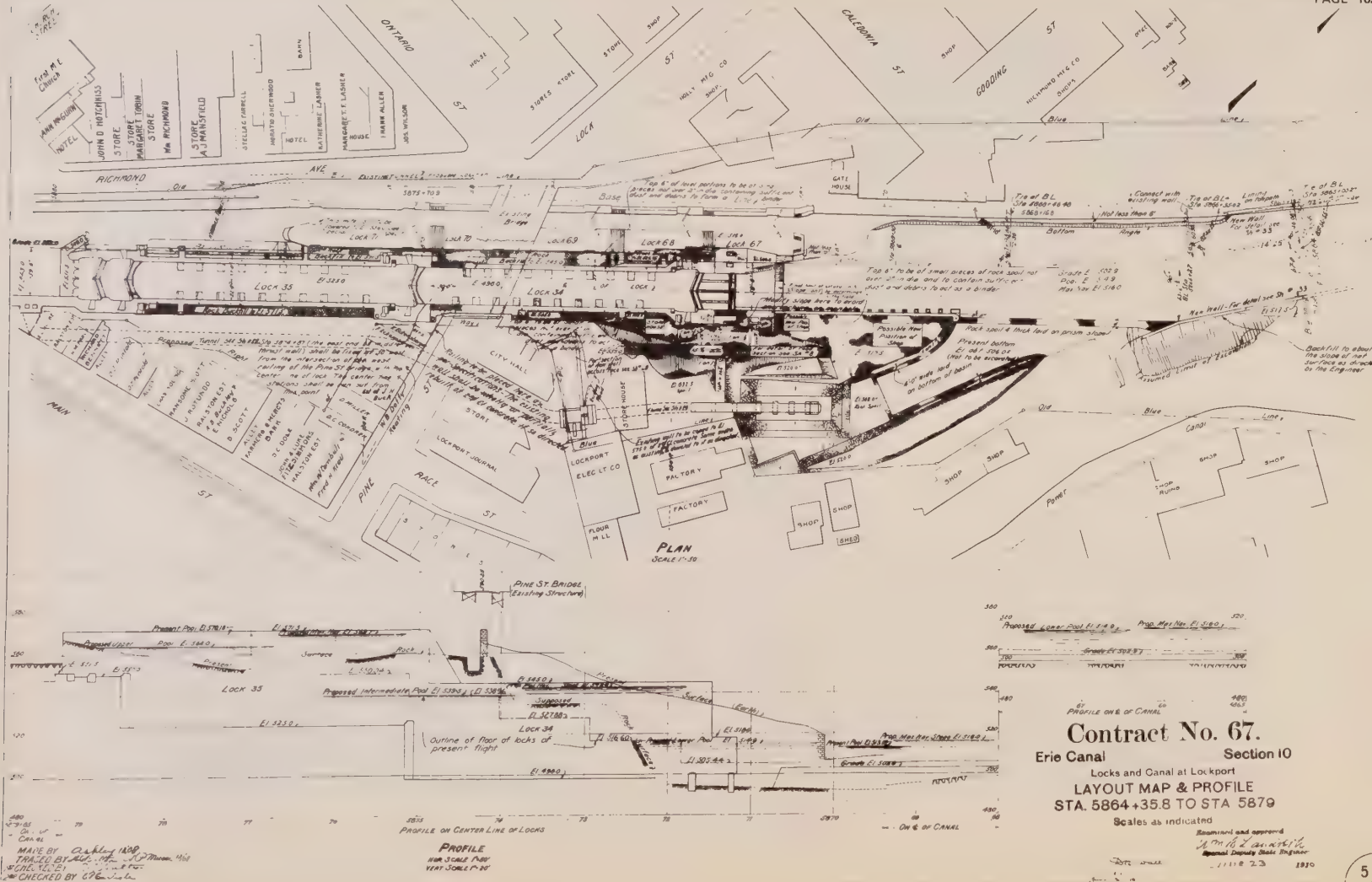


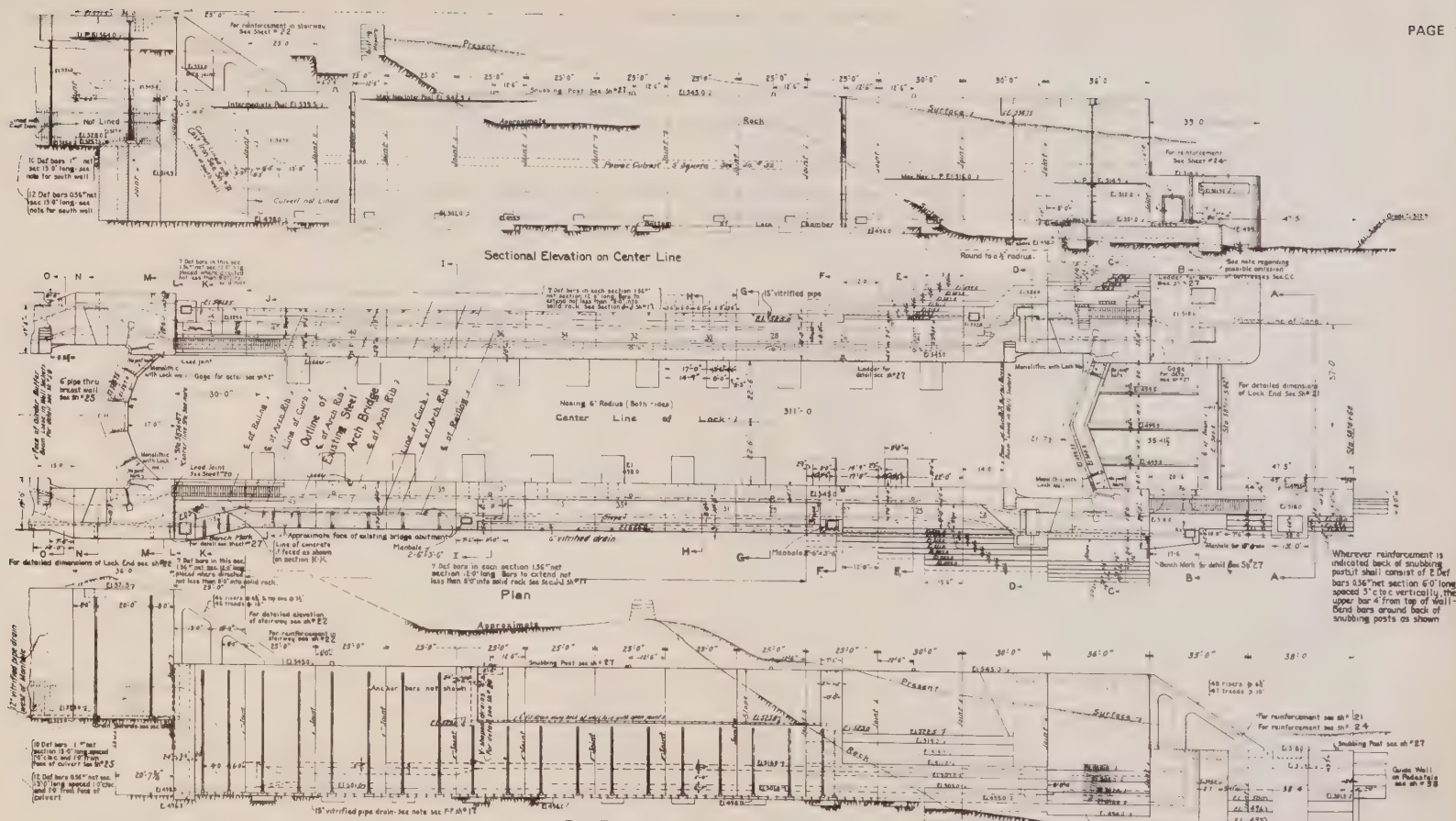
Looking East - Lock 35 Entrance

LOCK 35

| <u>Core Number</u> | <u>Location</u> | <u>Scaled Depth</u> | <u>Deteriorated Depth</u> | <u>Intentional Breaks</u> | <u>Recovered Depth</u> | <u>Total Depth</u> | <u>Comments</u> |
|--------------------|---|---------------------|---------------------------|---------------------------|------------------------|--------------------|--|
| 1 | North Side, 15' From West Gate, 4' From Top | 1" | 3" | 0 | 11" | 12" | Taken at water line, typical scaling along top. |
| 2 | North Side, 58' From West Gate, 25' From Top | 6" | 33½" | 0 | 27½" | 33½" | Deep scaling in this area, drilled along horizontal joint and 6" into limestone block. |
| 3 | West Sill, 15' From North Side, 14' Below Top of Sill | 2" | 11" | At 11" | 13" | 15" | |
| 4 | South Side, 35' From West Gate, 20' Below Top | 7" | 14" | At 22" | 20" | 27" | Deep scaling up to 12". |
| 5 | South Side, 102' From West End, 25' Below Top | 0" | 8" | 0" | 12" | 12" | Area typical of 75% of lock wall. |







The sections in south wall at bridge abutment shall be constructed, one at a time, each section to be completed and the concrete wall set before the under section.

Rock face against which masonry is to rest are to be chiseled unless otherwise directed by the State Engineer in writing. If the rock is soft the contractor shall extend the floor aprons in front of the ports to the amount directed by the State Engineer in writing. Where springs or leakage is encountered additional drains are to be put in where directed by the Engineer.

Figures enclosed thus U or index numbers indicating sections.

The uppermost six feet of sections No. 20, 21, 46 and 47 shall be built as monoliths and work one begun thrust shall be continued without interruption until the section is completed, also section 19 within limits X1-X2-X3 and X4 from EL 508.0 to EL 580.0 shall be built as a monolith in the same manner.

Rear Elevation of South Wall

All masonry shown on this sheet shall be second-class concrete.

For directions relating to modification of foundations see sheet #17.

All cross walls shall be well lagged into main walls by vertical keyways.

Top of lock walls to be crowned.

The edges of all walls are to be rounded to a radius of 2' unless otherwise shown.

Details and location of Electric Wire Conduits will be furnished later.

Contract No. 67.

Erie Canal Section 10

Locks and Canal at Lockport.
PLAN & ELEVATIONS OF LOCK 34

Scale 16 feet to the inch

Sta 5874+87 (the east end of middle thrust wall) shall be fixed at 30'-0" west from the intersection of the west railing of the Pine St Bridge with the center line of lock. The center line stations shall be run out from this point. All stations shown on this plan are center line stations.

The west wing of the existing south abutment of bridge projects from the end of the main abutment over the site of the south wall of lock #34. This wing wall shall be connected with the new masonry as the Engineer shall direct or it may be partially or entirely reconstructed if in the opinion of the Engineer it shall be necessary to do so.

Examined and approved

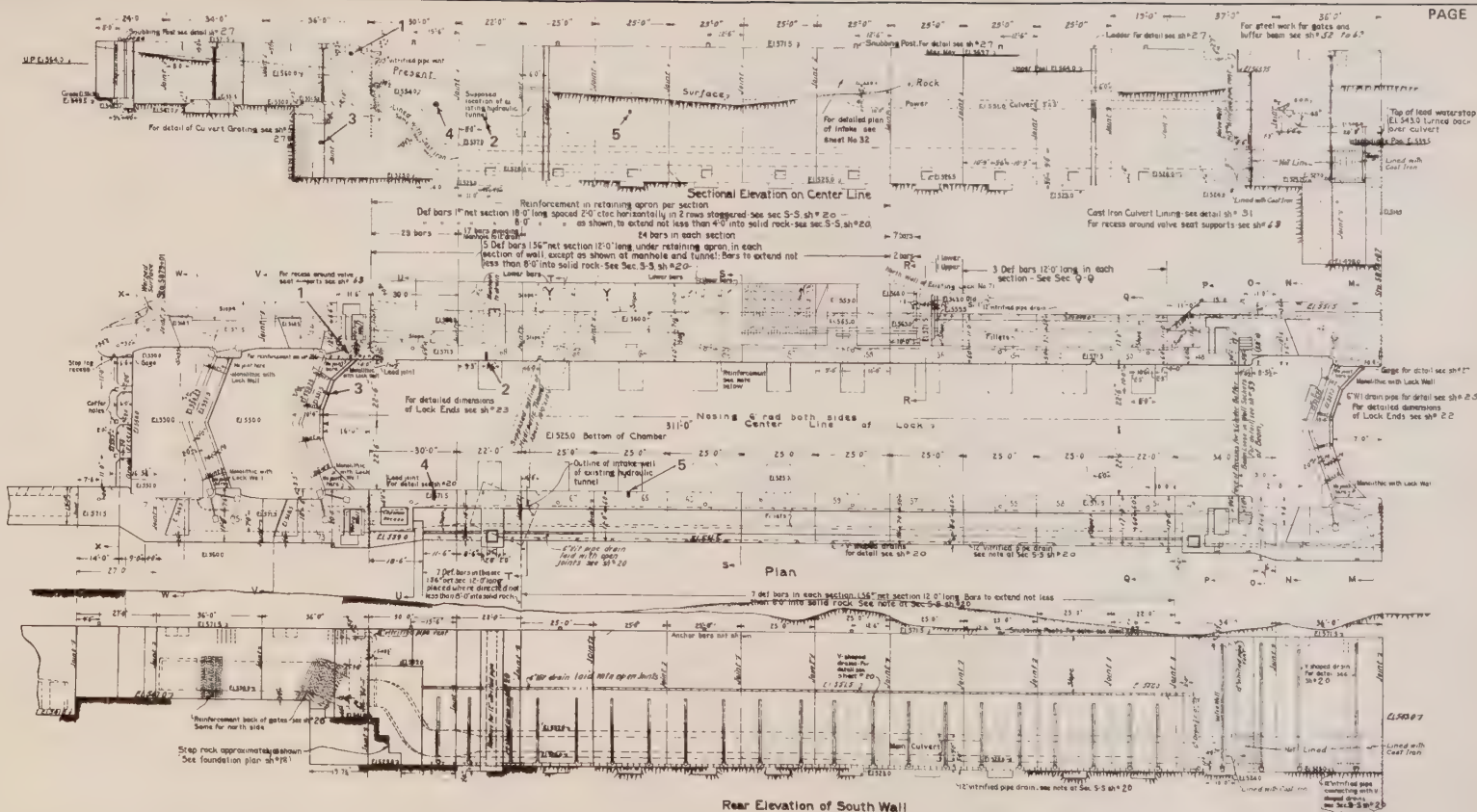
for the State Engineer

for the State Engineer

for the State Engineer

for the State Engineer

for the State Engineer



All masonry shown on this sheet shall be second-class concrete.

Top edges of all walls are to be rounded to a radius of 2" unless otherwise shown.

All cross walls shall be well keyed into main walls by vertical keyways.

Top of lock walls to be crowned 1/8".

For directions relating to modification of foundations see sheet #20.

Figures enclosed thus (25) are index numbers indicating sections.

The uppermost six feet of sections No 46, 47, 72, 73, 74 and 75 shall be built as masonry and work once begun thereon shall be continued without interruption until the section is completed.

Rock faces against which masonry is to rest are to be channeled unless otherwise directed by the State Engineer in writing.

If the rock is soft the contractor shall extend the floor aprons at the ports to the amount directed by the State Engineer in writing.

Where springs or leakage is encountered additional drains are to be put in where directed by the Engineer.

All stations shown on this plan are center line stations.

CORE LOCATIONS

Whenever reinforcement is indicated back of snubbing posts, it shall consist of 2 def bars 0.56" net section 6'-0" long spaced 5'-0" c/c vertically, the upper bar 4' from the top of wall. Bend bars around back of snubbing posts as shown on sheet #20.

Details and location of Electric Wire Conduits will be furnished later.

Contract No. 67.

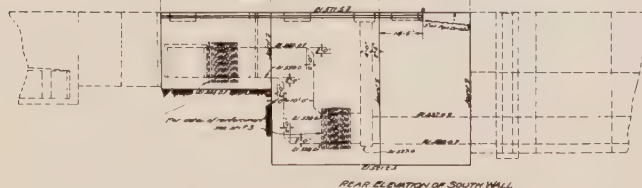
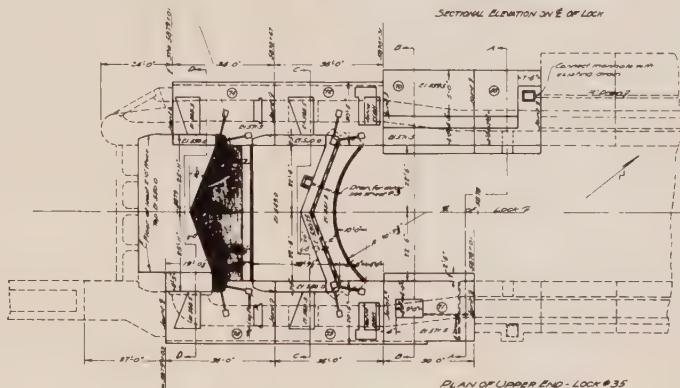
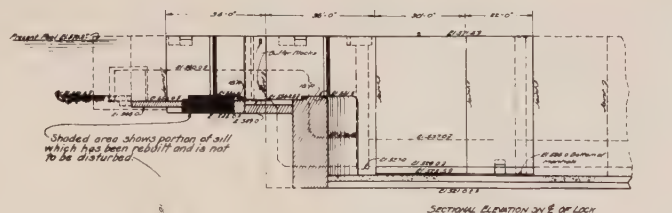
Erie Canal Section 10

Locks and Canal at Lockport
PLAN & ELEVATIONS OF LOCK 35

Scale 16 feet to the inch

MADE BY J. J. [Signature]
TRACED BY [Signature] 1/15/09
1st. CHECK BY [Signature]
2nd. CHECK BY [Signature]

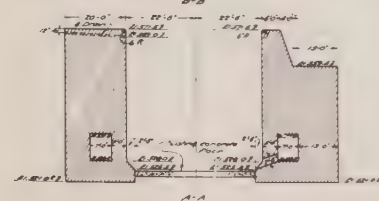
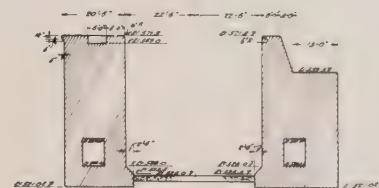
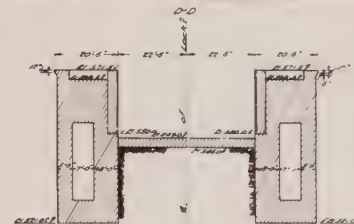
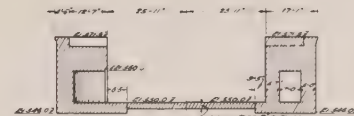
DR. [Signature]
[Signature]
June 23 1910



NOTES

Some lines indicate lines of new construction or portion of foot to be rebuilt.
Dashed lines show existing structure.
All necessary shown on this sheet should be indicated on concrete.
At exposed edges of concrete shall be returned to a radius of 2" unless otherwise shown.
The elevation of the base of the structure shown on this sheet are approximate.
The elevation shall be verified at the time of construction by the Engineer.
Masonry concrete block shall where structure by the Engineer.
Load walls, valves and equipment are not shown on this sheet.
For details of controller platforms, conduits etc. see on P & S 8.
An arrow denotes detail to see sheet P 3.
To section U see sheet P 4.
Rebar detail, see sheet P 5 for example.

The Contractor shall use great care in excavating adjacent to the portions of the foot which are not to be removed. All damage to such masonry shall be repaired at the Contractor's expense.



SEE CHANGES
PAGE 169

Contract No. 152

REBUILDING UPPON THE BRIDGE OF LOCK 36

Erte Canal Section 10
PLAN, ELEVATION AND CROSS SECTIONS
OF PORTION OF LOCK TO BE REBUILT
Scale as indicated

Examined and approved

July 27 1917
J. W. Mills
Division Engineer

Received of the
 [Signature] July 30 1927
 [Signature]

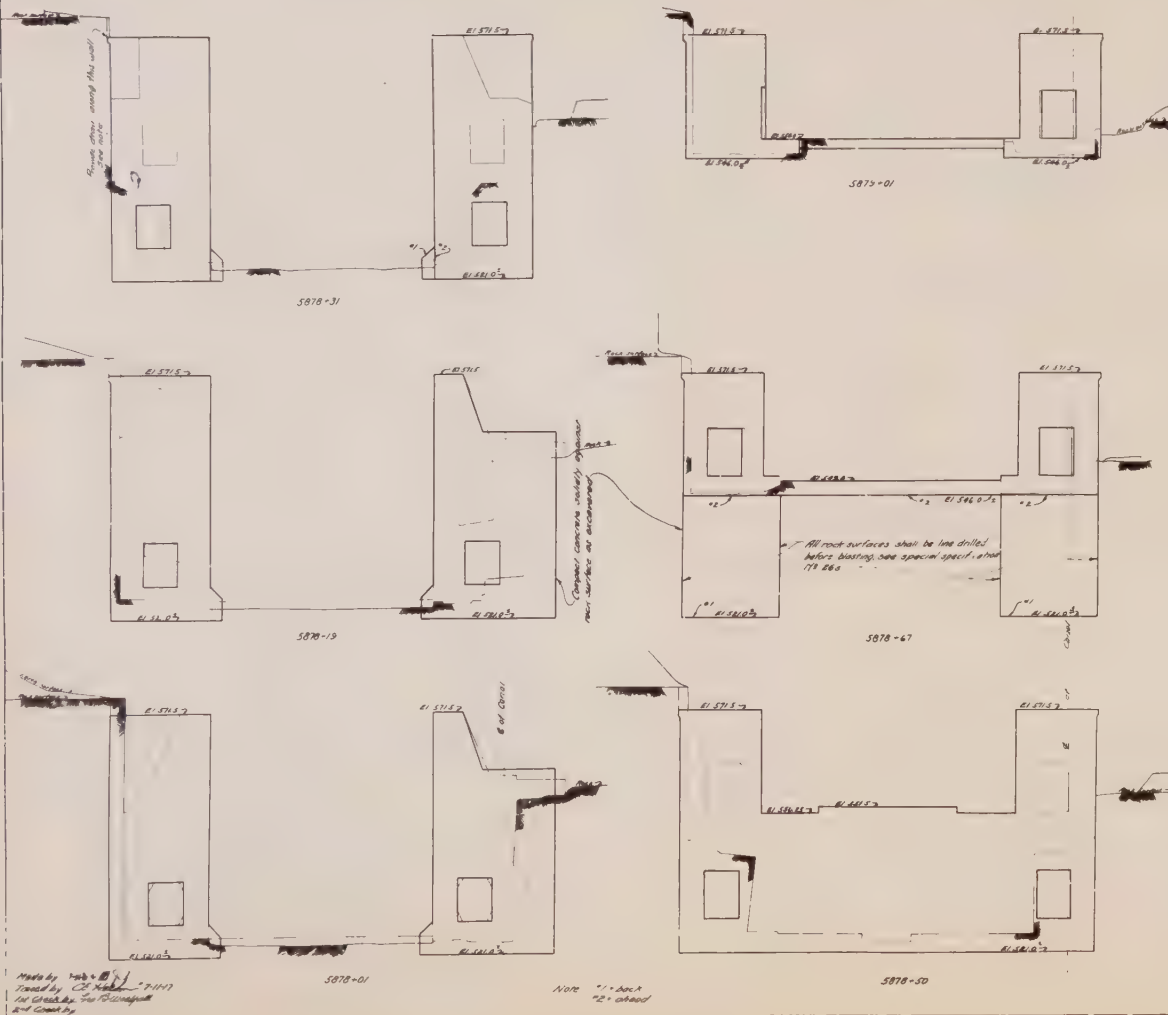
MADE BY Bro. H. W. W. W.
CHECKED BY J. H. W. W.
TRACE BY W. J. W. W.
END CHECK BY Bro. W. W. W.

NOTES

Light lines represent outlines of precast concrete structure
Heavy lines represent outlines of steel structure

All steel surfaces against which concrete is to be placed shall be freed from
these joints, cut to firm surfaces and cleaned just before concrete is placed. As
concrete is placed it shall be thoroughly compacted against and bonded with the

Under existing rock surfaces sloping more than 1 on 20 shall in general be stepped level. Provide a concrete lined open drain along back of south wall to connect with 6" drain through wall at Sta 5878+00. Details to be furnished by the Engineer. Payment for drain will be made at the contract prices for the various items involved.



Made by 1st & 2nd
Towed by C. H. H. 7-11-17
1st Coast by 2nd
2nd Coast by

Note *1 = back
*2 = ahead

Examined and approved

July 27 1917
F. Williams
Division Engineer.

Keywords: *Knowledge and experience*

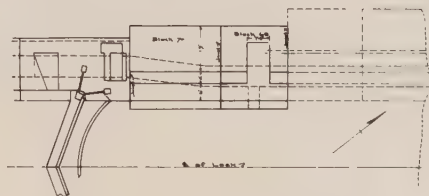
D. Macdonald

Contract No. 152

REBUILDING UPPER END OF LOGK 85

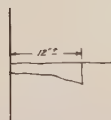
Erie Canal Section 10
CROSS SECTIONS SHOWING PRESENT
AND PROPOSED LOCK MASONRY

Scale One Inch Equals Ten Feet

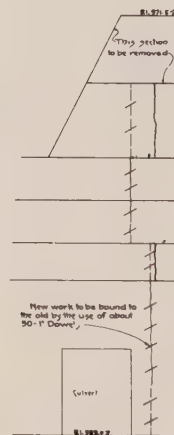


PLAN OF UPPER END OF LOCK No. 39
SHOWING BLOCK No 68 AS INTENDED TO BE REBUILT
UNDER CONTRACT No 152

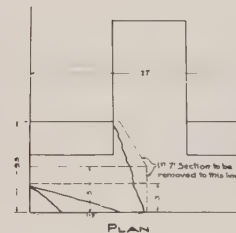
SCALE 1/2" = 1'-0"



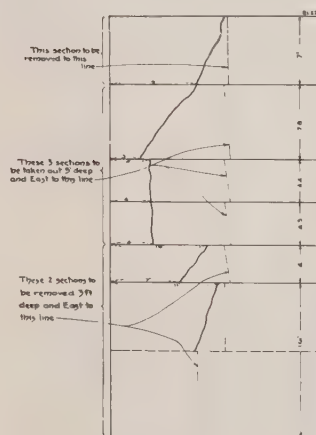
All cracks in old concrete which will be exposed when repairs on section are completed shall be chiseled out as shown and filled with grout in accordance with the instructions of the Engineer.



END ELEVATION



PLAN



FRONT ELEVATION

DETAILS OF ORIGINAL BLOCK No 68 SHOWING PROPOSED REPAIRS

SCALE 1/2\"/>

Contract No. 152

ALTERATION NO. 1

Erie Canal Section 10
PLAN AND SECTIONS SHOWING
REPAIRS TO BLOCK No. 68

Scales as indicated

NOTE: Anchor bolts shall be grouted in holes in existing masonry as provided in specification No. 215. This plan is intended to require and include all work and material necessary and proper to repair Block No. 68 in a substantial and workmanlike manner, satisfactory to the Engineer.

Examined and approved

April 1, 1920
L. C. Williams
District Engineer

Examined and approved

Apr 2 - 1920
J. C. Williams
Special Deputy District Engineer

Drawn by L. C. Williams
Designed by S. J. Brasher, Jr.
Checked by J. C. Williams, Jr.

10

Brockville Quarry Wall
Located at toe of north embankment between
Brockville Weir and State Route 387

PAGE 171



Looking South Across Flooded Quarry
Concrete retaining wall is on far side of quarry.



West End of Quarry Wall
Due to a number of leaks into the quarry, this wall
was constructed when the Barge Canal was built.



East End of Quarry Wall
The wall was inspected in the Winter 1976 when the
canal was empty. No cores were taken. Quarry
depth is not known.



Center of Quarry Wall
Although the wall surface contained a number of
efflorescent covered cracks, the concrete appeared
to be in generally good condition.

Except for the 12.5 mile section between Lock 32 and South Greece, construction of the Barge Canal between Fairport and Lockport (73.5 miles) included the widening and deepening of the enlarged Erie Canal. Throughout most of the remaining 61 mile section, the Barge Canal resembles a large ditch slightly elevated above the land. One of the main reasons for this type of construction, as opposed to a ditch depressed into the landscape, is the need to maintain the natural drainage patterns of the land. A ditch would cut off most of the small streams and deprive downstream areas of water. Also, all these streams feeding into the canal with their highly variable flow, would create numerous problems in controlling the canal water level. Therefore, nearly all the streams in this area pass under the canal in culverts or dive culverts (culverts which drop down on one side of the canal, pass underneath, and then come up on the other side).

Of the 97 culverts between Fairport and Lockport, 14 stone block arches (limestone) date back to the 1825 and 1862 Erie Canals, 81 cast-iron-pipes, concrete arches or concrete boxes were installed between 1909 and 1917 during Barge Canal construction, and two concrete pipes were placed since 1966. Various extensions were added to more than one third of these culverts due to embankment widening, highway construction and other reasons.

STONE BLOCK ARCH CULVERTS

When the 1825 Erie Canal stone block arch culverts were extended for the 1862 Erie Canal, the same type stone was used. Therefore, the extensions are no longer detectable. This was discovered in 1975 when a stone block arch culvert was partially uncovered and the 1825 culvert headwall was found buried in the embankment. Records do exist for this construction, but we assume that all the stone block arch culverts, except the indistinguishable extensions, date back to the original 1825 Erie Canal.

Although these arch culverts are over 150 years old, they are still in fair to good condition. The major problems noted were isolated stone block slippage, fractures, fractures along stone block bedding planes and leakage.

Most of the slippage appears to have occurred long ago, possibly soon after construction. Since the stone blocks are wedge shaped, they can slip down only a few inches if the joint material fails. Fracturing has caused some of the 1-foot wide by 2-foot deep by 3-foot long stone blocks to partially fall out, leaving cavities in the walls or ceiling. Leakage has been generally minor, causing discoloration and efflorescence. However, some locations have water spouting out under pressure.

WIDEWATER CULVERTS

High pressure leaks through any culvert are a cause for concern as this means there is a direct path between the leak and the canal. Any failure of this type could cause immediate serious problems. Some very slow leaks, however, have continued since original construction and will probably never cause any problems. What should be watched is any change in leak size or color and whether the water is carrying fine sediment. The slow washing out of embankment soil over the years will cause embankment settlement, or in the case of an overhead structure, possible sudden collapse.

Normally, slow leaks cause no problems, except in the case of one unique culvert. Culvert #96 is the only one that has a road, known as Culvert Road, passing through it. When extended for the Barge Canal, this culvert was the only one lengthened with stone blocks (Medina sandstone) instead of concrete. The 19-foot wide by 11-foot high stone arch culvert has a number of constant drips. During the winter months, this dripping causes ice buildup on the culvert floor and overhead ice masses. Many attempts have been made to try to cut off all leakage, but none have completely succeeded. In August of 1976, heavy leaks suddenly occurred and a contract to stop all leaks will be completed in the Spring of 1977.

During culvert inspections in 1975, three cast-iron-pipe culverts (#51, 68 and 90) were found to apparently have entrances under the only three large widewater areas (Spencerport, Holley and Knowlesville) between Rochester and Lockport. All were built as part of the Barge Canal to replace existing culverts under the enlarged Erie Canal. How a culvert could have an entrance under water and not drain any was discovered when Culvert #68 (the only one not half full of water) was crawled through from the exit or north end. The south end, a short distance in from the original entrance, contained a wooden plug. Behind this plug has to be concrete completely filling the entrance area. Thus, all three culverts were plugged prior to flooding the widewater areas.

In the Spring of 1976, an attempt was made to locate the entrances of these widewater culverts when the canal was drained, but all were found to be buried under ten feet or more of mud. The most unusual thing noted at this time was that all three wide water area south embankments, except for the widewater entrances, were lined with steel sheet piling.

Partial answers to all this were finally found in two Superintendent of Public Works Reports. In the 1928 Report,

"A sloughing of the upper slope of the canal bank west of Holley occurred just after the close of navigation in 1927. The pool was lowered, relieving the pressure against the bank, and early this year a line of steel sheet piling was driven through the affected area. The bank was restored and reinforced with heavy material along the outer toe and slope."

In the 1933 Report,

"There was no wet spoil area on the Sixty Mile Level of the Erie Canal, west of Rochester, making it necessary to rehandle all dredged material. Studies of the topography indicated the possibility of using a basin on the south side of the canal, west of Holley, where 18.34 acres of land lying below the canal were purchased. Cutting through the canal bank and flooding this area has provided a wet spoil of 225,000 cubic yards capacity."

What apparently happened at these three widewater areas is as follows:

1. Culverts built to replace old Erie Canal culverts.
2. South embankment in area of culverts began to fail.
3. Sheet piling driven to hold embankment areas.
4. Embankments continued to slowly fail.
5. Low land purchased, culverts plugged, section of embankment removed and areas flooded.

This solved two problems; the failing embankments and the acquisition of three needed wet spoil areas. Although Culverts #51 and 68 have center drains leading to the overhead canal, the three culverts presently serve no purpose.

BARGE CANAL CULVERTS

Most of the smaller culverts installed during the building of the Barge Canal were cast-iron-pipes encased in one foot of concrete. These one inch thick pipes are still in generally good condition with only some light internal rust and minor joint leakage.

A few of the cast-iron-pipe culverts also have concrete arch extensions even though they have not been lengthened since original construction. What happened is that Barge Canal construction called for lengthening the stone block arch culverts under the enlarged Erie Canal with concrete arches. Due to joint leakage and failures between these two arch sections, the decision was made to remove the stone block arch sections and replace them with cast-iron-pipes. Thus, these culverts appear to have been extended.

The rest of the smaller culverts were either concrete arches or concrete boxes, but there were also a few large concrete box culverts. All the extensions constructed at this time, and later extensions, were also made of concrete.

The largest culvert on the canal system is known as the Medina Aqueduct. This 50-foot wide by 17-foot high culvert, which carries Oak Orchard Creek under the 30-40 foot high wall section at Medina, is a rigid frame, steel arch encased in concrete. It is actually an arch bridge with high side walls for carrying water.

CULVERT PROBLEMS

Problems associated with the concrete culverts and extensions are confined mainly to deterioration caused by the freezing and thawing of water in the concrete. Headwall areas have generally suffered the most damage, but many are still in fair to good condition. Several also have scattered scale areas within the culverts where deep depressions exist. Two culverts had holes of approximately one square foot in area through the tops of the arch where gravel was washing in. Fortunately, these holes were near the ends of the culverts and not under the canal. Although nearly all the joints in the concrete culverts leak, joint deterioration varies from none to extensive in a few culverts.

Overall, most culverts are still in good condition. Although repairs are needed in many, the majority of these repairs are limited to small areas. The most extensive repairs are needed on the few old, stone block arch culverts. General observed conditions which hinder the functioning and maintenance of the culverts include:

1. Exit channels were filled (or silted in) which caused culverts to fill up.
2. Extensive vegetation was present at entrances and exits which hinder any inspection.

3. Trees and shrubs growing over entrances and exits have tilted headwalls, and roots have forced cracks to open further.
4. Internal debris has clogged culverts. This has caused the water to back up and seek other paths under the canal, or blow up into the canal through loose drain covers or cracks.
5. Rocks and trash have collected in entrance and exit wells of some culverts.
6. Culverts with low velocity water have slowly silted up over the years.
7. Present repair and cleaning is now much more extensive than if it had periodically been done in the past.
8. Past repairs were generally made after problems occurred.
9. Culvert exits on the north side of canal are generally easily accessible (for inspection) from the towpath. However, no convenient way exists to inspect the majority of culvert entrances. Some even require crossing private property.

REDISCOVERED CULVERTS

While inspecting Culvert #59 in 1975, two culverts were found 40 feet apart inside a newly constructed common exit. After some research, it was found that Culvert #59 (twin 42-inch cast-iron-pipes) was built in 1910. The lower half of Culvert #59½ (a 48 inch concrete pipe) contains an 18 inch concrete sewer pipe encased in concrete. Culvert #59½ was installed by the Village of Brockport in 1966 by Permit #66-1-9.

Due to the possibility of other "lost" culverts existing under the canal, all old Barge Canal contracts and other plans were reviewed. Culvert #124 was relocated with the finding of Superintendent of Public Works plans dated 1917. Found in Contract 162 was a 16-inch cast-iron-pipe drain placed under the canal in 1917 next to the Main Street Bridge in Brockport. This culvert is now called #58½.

The existence of Culvert #30½ in the Irondequoit Creek embankment was unknown. However, research has verified that this long abandoned culvert does exist. (See History - Barge Canal Construction - Bushnell Basin to Cartersville.)

Also examined were all the canal permits on file with the Waterways Maintenance Subdivision in Albany. These permits, which grant municipalities and others the right to use or place pipelines across canal land, date from the original Erie Canal to the present. A few recorded old permits could not be found.

However, the sparseness and irregular dates of older permits (prior to 1900) leads one to believe that many permits no longer exist.

Most of the permits were for gas, water and sewer lines under the canal. However, Permit #1933-12-312 granted the right to construct an 18-inch sewer south of the canal and to connect with an existing sewer crossing at Medina. A check of the permit revealed that this sewer connected to a large 4-foot by 5-foot arch sewer under the canal at Glenwood Avenue. Two other older permits (1913-12-260 and 1907-3-10) also granted rights to relocate and place sewers on the south side of the canal to connect with this existing sewer crossing.

A check of Barge Canal Contract 65, under which the Barge Canal was constructed at Medina from 1913-1915, revealed no sewer or culvert work in the Glenwood Avenue area. Since the 1913 and 1907 permits allowed the Town of Medina to relocate sewer lines in anticipation of the Barge Canal, and no work was done by the State, the existing sewer crossing was already down deep enough to not be disturbed by the new Barge Canal. However, an old Contract 65 photograph showed the top of the culvert uncovered in a shallow trench and the contractor placing concrete over it. No permit could be found for this sewer crossing.

Therefore, it must be assumed that this 4-foot by 5-foot high by 500-foot long stone block arch culvert or sewer was most probably built at the time of the first Erie Canal in 1825. It is now called Culvert #99½.

On February 18, 1976, Mr. Wayne Ward, Town of Medina Department of Public Works Supervisor, was contacted. He was aware of the combined storm and sanitary sewer and had been down one of the brick manhole entrances. However, to his knowledge, no one had ever completely inspected it. On September 2, 1976, in another meeting with Mr. Ward, the potential dangers of inspecting this culvert were discussed. At the upstream manhole (south side of canal), sewer water cascades from an upper level to a much lower level and then passes under the canal in a 6-12 inch deep stream. Therefore, one would have to enter at the downstream manhole and travel upstream 500 feet to the base of the waterfall and back again. Inhaled raw sewage mist and the possibility of someone in Town dumping gasoline or other dangerous substances into the sewer at the time of inspection requires that a self-contained breathing apparatus be used for this inspection. Mr. Ward believed that the local fire department would supply the required equipment.

Although culverts #59½ (Brockport) and #99½ (Medina) are not owned by the State, responsibility for their inspection may have to rest with the State due to the consequences of any failures.

CULVERT ABBREVIATIONS USED

| | | |
|--------------|---|---|
| 2-36" C.I.P. | = | two, 36 inch diameter, cast iron pipe culverts |
| 10'-2" x 7' | = | 10 feet, 2 inch wide by 7 feet high culvert |
| Conc. Pipe | = | concrete pipe culvert (recently installed) |
| Box | = | rectangular shaped culvert |
| Arch | = | upside down, U shaped culvert |
| Dive | = | A culvert that slopes down or drops vertically at the entrance, passes under the canal and then slopes up or rises vertically at the exit. Therefore, it is always filled with water. |
| Br. | = | Creek Branch |

| <u>No.</u> | <u>Station</u> | <u>Barrels</u> | <u>Size</u> | <u>Type</u> | <u>Length</u> | <u>Stream</u> | <u>Comments</u> |
|------------|----------------|----------------|----------------|------------------------------------|----------------------|-----------------------|--|
| 26 Dive | 1803+00 | 5 | 48" | C.I.P. | 192.5' | White Brook | Not Inspected |
| 27 Dive | 1938+93 | 1 | 30" | C.I.P. | 197' | Irondequoit Creek Br. | Not Inspected |
| 28 | 1994+35 | 2 | 36" | C.I.P. | 213' | Irondequoit Creek Br. | Good Condition |
| 29 | 2064+80 | 1 | 84" | Conc. Pipe | 333' | Irondequoit Creek Br. | Good Condition (New 1975) |
| 30 | 2115+20 | 2 | 12' x 9' | Conc. Box | 508' | Irondequoit Creek | Good Condition Isolated Deterioration |
| 30½ | 2124+15 | 1 | 2' x 2' 6" | 598' Conc. Box 116' C.I.P. | 714' Skewed | None | Not Inspected Buried in Embankment |
| 31 Dive | 2202+35 | 1 | 42" | C.I.P. | 192.5' + 135' Ext. | Irondequoit Creek Br. | Not Inspected |
| 33 Dive | 2276+60 | 1 | 8' x 8' | Conc. Box | 185' + 75' R.R. Ext. | Allen Creek Br. | Not Inspected |
| 34 Dive | 2300+16 | 1 | 42" | C.I.P. | 304' | Allen Creek Br. | Not Inspected |
| 35 | 2253+55 | 2 | 8' x 6' | Conc. Box | 401' Skewed | Allen Creek | Repairs Needed |
| 43 Dive | 2743+70 | 1 | 4' x 3'3" | Conc. Arch | 189' + 235' Ext. | Round Pond Creek Br. | Not Inspected |
| 44 | 3044+75 | 1 | 42" 4' x 3' | 132' C.I.P. 72.5' Conc. Arch | 204.5' | Round Pond Creek Br. | Repairs Needed. 36' of Corr. Metal Pipe Recently Installed. |
| 45 | 3072+50 | 1 | 48" 4' x 4' | 132' C.I.P. 74' Conc. Arch | 206' | Round Pond Creek | Repairs Needed |
| 46 | 3182+85 | 1 | 5.5' x 4' | Conc. Arch | 206.5' | Larkin Creek | Not Inspected |
| 47 | 3281+12 | 1 | 8' x 7' | Conc. Arch | 220.5' | Northrup Creek | Future Repairs Needed |
| 48 Dive | 3305+85 | 1 | 36" | C.I.P. | 216' | Black Creek | Not Inspected. Not Originally built as dive culvert. |
| 49 | 3325+18 | 1 | 42" 4' x 3' | 136.5' C.I.P. 102.5' Conc. Arch | 239' | Buttonwood Creek | Repairs Needed |
| 50 | 3348+00 | 1 | 42" 4' x 3' | 148.5' C.I.P. 73' Conc. Arch | 221.5' | Buttonwood Creek Br. | Future Repairs Needed |
| 51 | 3362+15 | 1 | 42" 4' x 3' | 136.5' C.I.P. 82' Conc. Arch | 218.5 | Buttonwood Creek Br. | Not Inspected. South end plugged. |
| 52 | 3430+70 | 1 | 4' x 4' | Conc. Box | 210.5' | Salmon Creek Br. | Not Inspected |

REGION 4 CULVERTS

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| <u>No.</u> | <u>Station</u> | <u>Barrels</u> | <u>Size</u> | <u>Type</u> | <u>Length</u> | <u>Stream</u> | <u>Comments</u> |
|------------|----------------|----------------|---------------------------------|---|------------------------------|---------------------------|---|
| 53 | 3440+00 | 2 | 2@ 42" 6' x 3.5' | 172.5' C.I.P. 165.5' Conc. Arch | 338' | Salmon Creek Br. | Repairs Needed |
| 54 | 3453+53 | 2 | 12' x 6'7" | 124' Stone Arch 78' Conc. Arch | 202' | Salmon Creek | Repairs Needed |
| 55 Dive | 3522+00 | 1 | 8' x 5' | Conc. Arch | 197' | Salmon Creek Br. | Not Inspected |
| 55½ Dive | 3567+78 | 1 | 2' x 1.5' | Conc. Box | 235' | Otis Creek Br. | Not Inspected |
| 56 Dive | 3592+33 | 2 | 2@ 48" 7.5' x 5' 12' x 8' | 130' C.I.P. 90' Conc. Arch 11' Conc. Slab | 231' | Otis Creek | Not Inspected |
| 57 | 3632+87 | 1 | 4' x 4.5' | 151.5' Stone Arch 80' Conc. Arch | 231.5 | Brockport Creek | Repairs Needed |
| 58 Dive | 3671+84 | 1 | 48" 3.5' x 4.5' | 144.5' C.I.P. 78.5' Conc. Arch | 223' | Brockport Creek Br. | Not Inspected |
| 58½ | 3689+71 | 1 | 16" | C.I.P. | 145' | Brockport Creek Br. | Not Inspected |
| 59 | 3710+26 | 2 | 2@ 42" 8' x 4' | 180' C.I.P. 22' Conc. Box | 202' + Ext. | Brockport Creek Br. | Good Condition. Extends ¼ mile to College Campus. |
| 59½ | 3710+68 | 1 | ½ - 48" 36" | 165' Conc. Pipe 35' C.I.P. | 200' Connects to Culvert #59 | Brockport Creek Br. | Fair condition. 18" sewer encased in bottom half. |
| 60 | 3758+12 | 1 | 48" | C.I.P. | 213' | Moorman Creek Br. | Minor repair needed. |
| 61 Dive | 3803+82 | 1 | 5.5' x 4'3" | Conc. Arch | 204.5' | Moorman Creek | Not Inspected |
| 62 Dive | 3830+35 | 1 | 4' x 4' | Conc. Arch | 203' | W. Fork Moorman Creek Br. | Not Inspected |
| 63 ½ Dive | 3856+82 | 1 | 60" | C.I.P. | 197.5' | W. Fork Moorman Creek | Not Inspected |
| 64 Dive | 3887+12 | 1 | 42" | C.I.P. | 187' | E. Br. Sandy Creek Br. | Not Inspected |
| 65 | 3915+65 | 1 | 12' x 11'1" | 364' Stone Arch 156' Conc. Arch | 520' | E. Br. Sandy Creek | Fair to Good condition |
| 66 | 3943+93 | 1 | 42" | C.I.P. | 207' | E. Br. Sandy Creek Br. | Not Inspected |
| 67 | 3978+04 | 1 | 48" | C.I.P. | 231' | E. Br. Sandy Creek Br. | Good Condition |
| 68 | 3998+40 | 1 | 42" | C.I.P. | 240' | E. Br. Sandy Creek Br. | Good Condition. South end plugged. |

| <u>No.</u> | <u>Station</u> | <u>Barrels</u> | <u>Size</u> | <u>Type</u> | <u>Length</u> | <u>Stream</u> | <u>Comments</u> |
|-----------------|----------------|----------------|--------------|---|---------------|------------------------|-----------------------------------|
| 69 Dive | 4073+13 | 1 | 5' x 4' | Conc. Box | 204' | W. Br. Sandy Creek Br. | Not Inspected. Embankment leaks. |
| 70 Dive | 4106+98 | 1 | 3'9" x 3'9" | Conc. Box | 178' | W. Br. Sandy Creek Br. | Not Inspected |
| 71 Dive | 4151+75 | 3 | 7'8" x 4' | Conc. Box | 179' | W. Br. Sandy Creek Br. | Not Inspected |
| 72 Dive | 4205+53 | 2 | 42" | C.I.P. | 194' | W. Br. Sandy Creek Br. | Not Inspected |
| 73 Dive | 4273+52 | 1 | 3'9" x 3'9" | Conc. Box | 203.5' | W. Br. Sandy Creek Br. | Not Inspected |
| 73½ Double Dive | 4290+73 | 1 | 36" | C.I.P. | 183' | W. Br. Sandy Creek Br. | Not Inspected |
| 74 Dive | 4313+68 | 1 | 3'9" x 3'9" | Conc. Box | 205' | W. Br. Sandy Creek Br. | Not Inspected |
| 75 Dive | 4361+81 | 1 | 24" | G.I.P. | 204' | W. Br. Sandy Creek Br. | Not Inspected |
| 76 ½ Dive | 4380+49 | 1 | 42" | C.I.P. | 217' | W. Br. Sandy Creek Br. | Not Inspected |
| 77 | 4411+32 | 2 | 12' x 6'3" | 135.5' Stone Arch 40.5' Conc. Arch | 176 | W. Br. Sandy Creek | Repairs Needed |
| 78 Dive | 4418+11 | 1 | 42" | C.I.P. | 216' | W. Br. Sandy Creek Br. | Not Inspected |
| 79 Dive | 4439+20 | 1 | 30" | C.I.P. | 144' | Marsh Creek Br. | Not Inspected |
| 80 Dive | 4448+72 | 1 | 42" | C.I.P. | 190' | Marsh Creek Br. | Not Inspected |
| 82 Dive | 4478+40 | 1 | 60" | C.I.P. | 195.5' | Marsh Creek Br. | Not Inspected |
| 83 Dive | 4494+70 | 1 | 42" | C.I.P. | 243' | Marsh Creek | Not Inspected |
| 84 Dive | 4514+12 | 1 | 42" | C.I.P. | 207' | Marsh Creek Br. | Not Inspected |
| 85 Dive | 4554+60 | 1 | 42" | C.I.P. | 195' | Beardsley Creek | Not Inspected |
| 86 | 4587+55 | 1 | 10.5' x 7'9" | 300.5' Stone Arch 24' Conc. Arch 25'± Conc. Box | 350'± | Otter Creek | Fair to Good condition |
| 87 Dive | 4603+23 | 1 | 30" | C.I.P. | 182' | Otter Creek Br. | Not Inspected |
| 88 Dive | 4619+35 | 1 | 48" | C.I.P. | 221.5' | Otter Creek Br. | Not Inspected |
| 89 | 4642+68 | 1 | 30" | C.I.P. | 222.5' | Oak Orchard Creek Br. | Not Inspected |
| 90 | 4692+10 | 1 | 48" | C.I.P. | 217.5' | Oak Orchard Creek Br. | Not Inspected. South end plugged. |

REGION 4 CULVERTS

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| <u>No.</u> | <u>Station</u> | <u>Barrels</u> | <u>Size</u> | <u>Type</u> | <u>Length</u> | <u>Stream</u> | <u>Comments</u> |
|------------|----------------|----------------|---|--|---------------|-----------------------|------------------------|
| 91 Dive | 4741+85 | 1 | 30" | C.I.P. | 182.5' | Oak Orchard Creek Br. | Not Inspected |
| 92 | 4773+18 | 2 | 7.5' x 3'7" 2@ 42" 6' x 4' 4' x 3.5' 4' x 3.5'± | 96' Conc. Arch 191' C.I.P. 58' Conc. Arch 150'± Conc. Box 30'± Planked over Stone Walls | 525'± | Oak Orchard Creek Br. | Not Inspected |
| 93 Dive | 4779+05 | 1 | 36" | C.I.P. | 182' | Oak Orchard Creek Br. | Not Inspected |
| 94 Dive | 4824+20 | 1 | 36" | C.I.P. | 181.5' | Oak Orchard Creek Br. | Not Inspected |
| 95 | 4850+58 | 2 | 10'2" x 7' | 176' Stone Arch 30' Conc. Arch | 206' | Fish Creek | Repairs Needed |
| 96 | 4856+55 | 1 | 19' x 11'± | Stone Arch | 202' | Culvert for Vehicles | To be Repaired in 1977 |
| 97 Dive | 4896+75 | 2 | 36" | C.I.P. | 181.5' | Oak Orchard Creek Br. | Not Inspected |
| 98 Dive | 4918+40 | 1 | 48" | C.I.P. | 221.5' Skewed | Oak Orchard Creek Br. | Not Inspected |
| 99 | 4987+16 | 1 | 50' x 17' | Conc. Arch | 159' | Oak Orchard Creek | Repairs Needed |
| 99½ | 5008+90± | 1 | 4' x 5' | Stone Arch | 500'± | Medina Sewer | Not Inspected |
| 100 Dive | 5038+18 | 2 | 42" | C.I.P. | 185' | Oak Orchard Creek Br. | Not Inspected |
| 101 | 5067+83 | 2 | 42" | C.I.P. | 204.5' | Jeddo Creek Br. | Not Inspected |
| 102 | 5109+83 | 1 | 36" | C.I.P. | 196' | Jeddo Creek Br. | Not Inspected |
| 103 | 5130+09 | 1 | 12' x 10' | 174' Stone Arch 59' Conc. Arch | 233' | Jeddo Creek | Repairs Needed |

REGION 5 CULVERTS

| <u>No.</u> | <u>Station</u> | <u>Barrels</u> | <u>Size</u> | <u>Type</u> | <u>Length</u> | <u>Stream</u> | <u>Comments</u> |
|------------|----------------|----------------|-------------|-------------|---------------|-------------------|-----------------------------------|
| 104 | 5220+57 | 1 | 36" | C.I.P. | 214' | Jeddo Creek Br. | Good Condition |
| 105 Dive | 5244+18 | 1 | 30" | C.I.P. | 180' | Jeddo Creek Br. | Not Inspected |
| 107 | 5259+42 | 2 | 12' x 5' | Stone Arch | 147' | Jeddo Creek Br. | Poor condition. Repairs underway. |
| 108 Dive | 5285+48 | 1 | 42" | C.I.P. | 197.5' | Johnson Creek Br. | Not Inspected |
| 109 | 5340+80 | 1 | 9' x 7' | Stone Arch | 231' | Johnson Creek | Repairs Needed |

REGION 5 CULVERTS

PAGE 182

| <u>No.</u> | <u>Station</u> | <u>Barrels</u> | <u>Size</u> | <u>Type</u> | <u>Length</u> | <u>Stream</u> | <u>Comments</u> |
|------------|----------------|----------------|---------------------------|--|---------------|--------------------------|--|
| 110 | 5410+40 | 1 | 48" 4' x 4' | 197' C.I.P. 20.5' Conc. Arch | 217.5 | Johnson Creek Br. | Good condition. Headwall repairs needed. |
| 111 | 5436+80 | 1 | 48" 4' x 4' | 188' C.I.P. 20.5' Conc. Arch | 208.5' | E. Br. 18 Mile Creek Br. | Good condition |
| 112 Dive | 5454+24 | 1 | 36" | C.I.P. | 207.5' | E. Br. 18 Mile Creek Br. | Not Inspected |
| 113 | 5485+40 | 1 | 18' x 10' | 190' Stone Arch 30' Conc. Arch | 220' | E. Br. 18 Mile Creek | Good condition. Lined with corrugated metal. |
| 114 Dive | 5516+87 | 1 | 30" | C.I.P. | 185.5' | E. Br. 18 Mile Creek Br. | Not Inspected |
| 115 | 5536+80 | 1 | 4' x 4' | Conc. Box | 245.5' | E. Br. 18 Mile Creek Br. | Good condition |
| 115½ | 5556+98 | 1 | 24" | C.I.P. | 231.5' | E. Br. 18 Mile Creek Br. | Good condition |
| 116 Dive | 5614+00 | 1 | 4' x 3' | Conc. Arch | 191' | E. Br. 18 Mile Creek Br. | Not Inspected |
| 117 Dive | 5627+12 | 1 | 4' x 3' | Conc. Arch | 208.5' | E. Br. 18 Mile Creek Br. | Not Inspected |
| 118 | 5650+03 | 1 | 6' x 5' | 203' Stone Arch 30' Conc. Arch | 233' | E. Br. 18 Mile Creek Br. | Repairs Needed |
| 119 | 5694+82 | 2 | 2@ 48" 6' x 5' | 159' C.I.P. 110' Conc. Arch | 269' | E. Br. 18 Mile Creek Br. | Good condition. Minor repairs and cleaning needed. |
| 120 | 5722+15 | 1 | 6' x 5' | 228.5' Stone Arch 35' Conc. Arch 12'+ Conc. Box 25'+ Metal Arch | 300'+ | E. Br. 18 Mile Creek Br. | Good condition |
| 121 | 5746+33 | 1 | 42" 4' x 3' 4' x 3' | 165' C.I.P. 36' Conc. Arch 29' Conc. Box | 230' | E. Br. 18 Mile Creek Br. | Good condition. Repair Joint and fill hole. |
| 122 | 5766+42 | 1 | | Conc. Box | 235' | E. Br. 18 Mile Creek Br. | Good condition |
| 123 Dive | 5791+60 | 1 | 30" | C.I.P. | 262' | E. Br. 18 Mile Creek Br. | Good condition |
| 124 | 5840+18 | 1 | 2.5' x 2.5' | Conc. Box | 157' | 18 Mile Creek Br. | Not Inspected |
| 125 Dive | 5847+50 | 1 | 12' x 5'10" | 118' Conc. Arch 40' Stone Arch | 158' | 18 Mile Creek | Not Inspected |

Culvert #26 (Dive) 192.5' of 5-48" Cast Iron Pipes
Not Inspected



Exit
High Water Covered Headwall

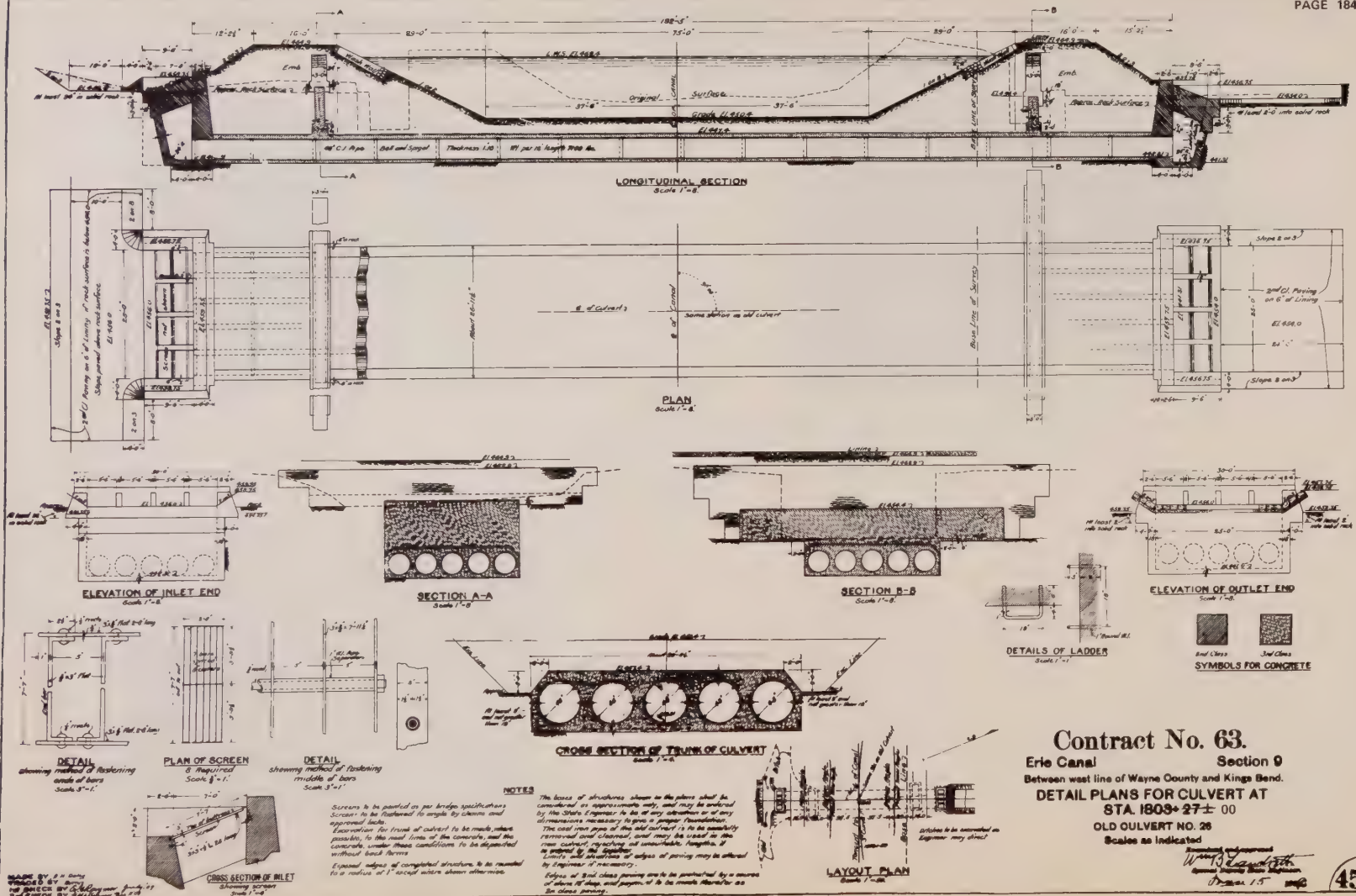
Culvert #27 (Dive) 197' of 30" Cast Iron Pipe
Not Inspected



Exit
Concrete headwall was in good condition.
After cleaning by Canal Maintenance Forces,
first 12 feet at exit was inspected, but
rest of pipe was half full of mud.

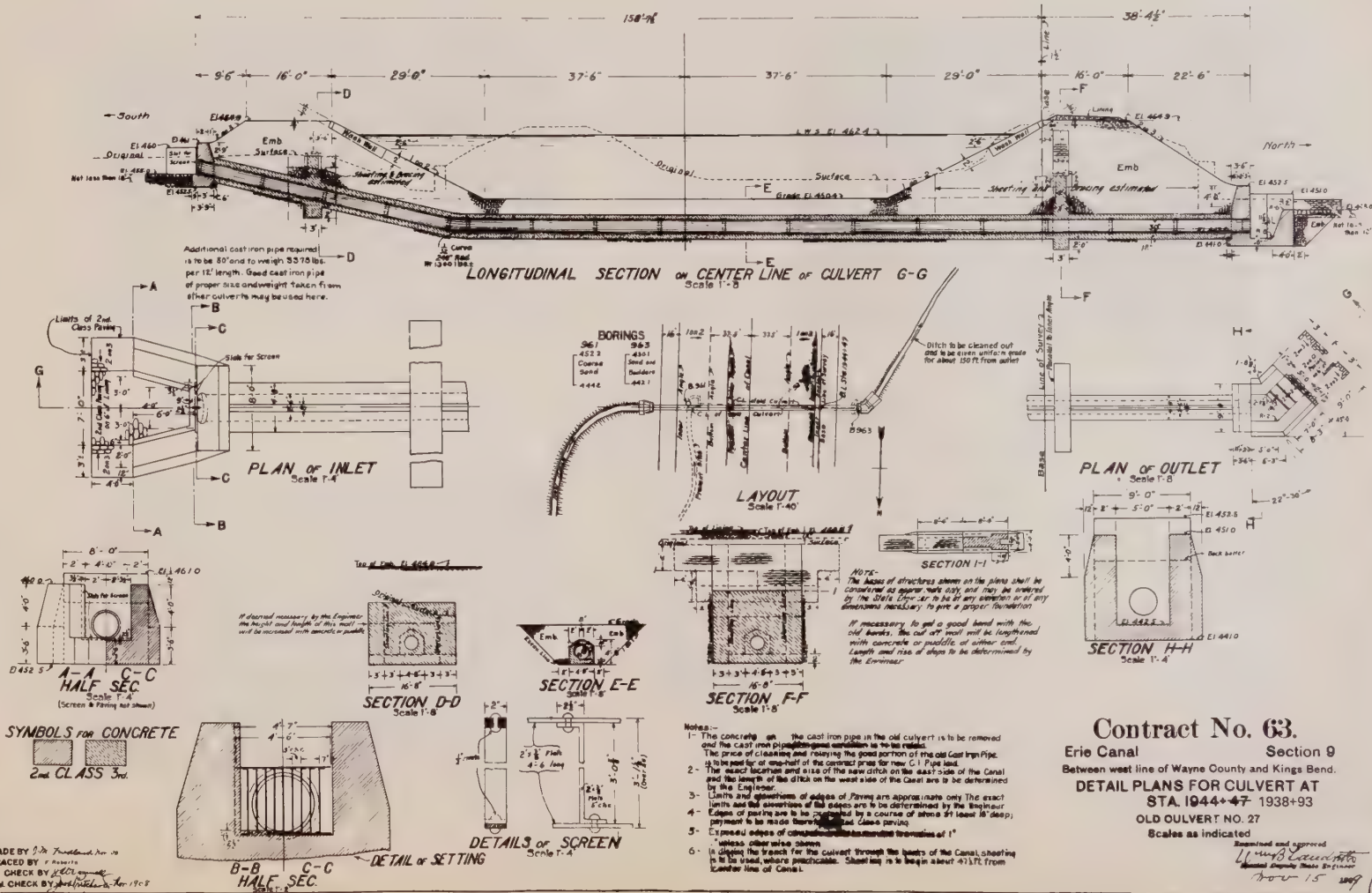


Exit area after embankment cleared for widening
in 1976. Culvert is to be lengthened. These
deep culvert wells present hazards to children in
residential areas.



Contract No. 63.
Erie Canal **Section 9**
 Between west line of Wayne County and Kings Bend.
DETAIL PLANS FOR CULVERT AT
STA. 1803+27± 00
OLD CULVERT NO. 26
 Scale as indicated

Wm B. Land
Page 15





Entrance

Trash rack in foreground. Some localized deep scaling on headwall, but generally in good condition.

Cast-iron culvert was in good condition. Some seepage noted at nearly all joints.



Old Exit

Deep scour hole at exit. Headwall area in good condition. Sewer crosses stream in foreground.



New Exit

In 1976, embankment was widened and culvert lengthened. Light snow on ground.

Old Culvert #29 6' Wide x 5' High Stone Block Arch
Lined in 1914 with 48" Cast Iron Pipe

New Culvert #29 333' of 84" Concrete Pipe
Constructed in 1975 under Contract M 75-2

PAGE 188

See History - Barge Canal Construction
Bushnell Basin to Cartersville



Exit

Entrance and exit headwall areas and culvert never thoroughly inspected. However, all joints in the cast iron lining, as seen from both ends, were heavily coated with mineral deposits. This means slow seepage through the joints.



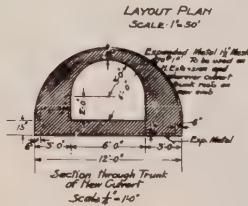
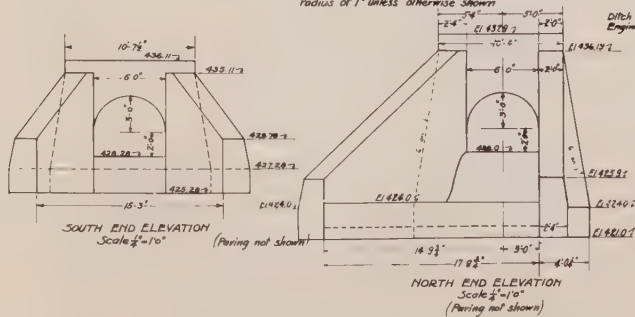
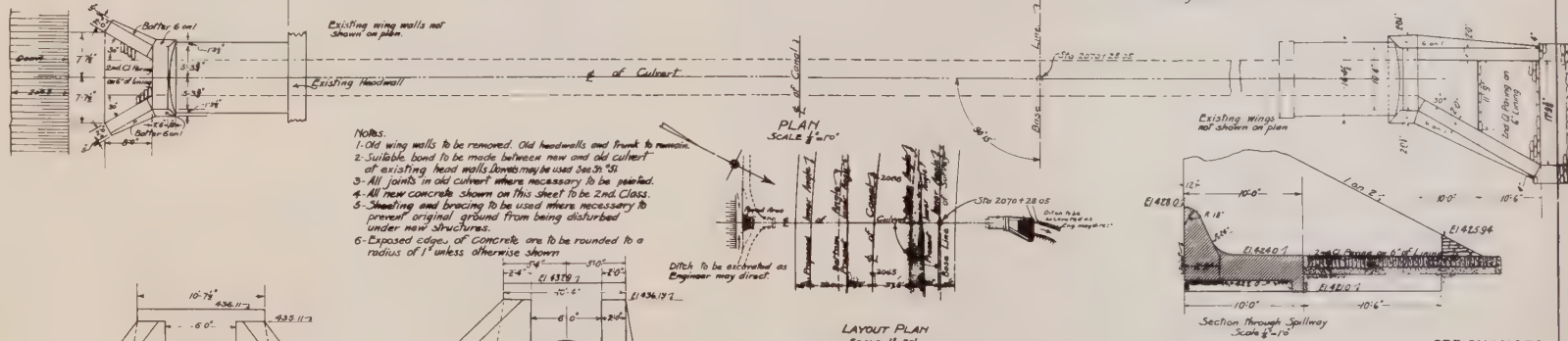
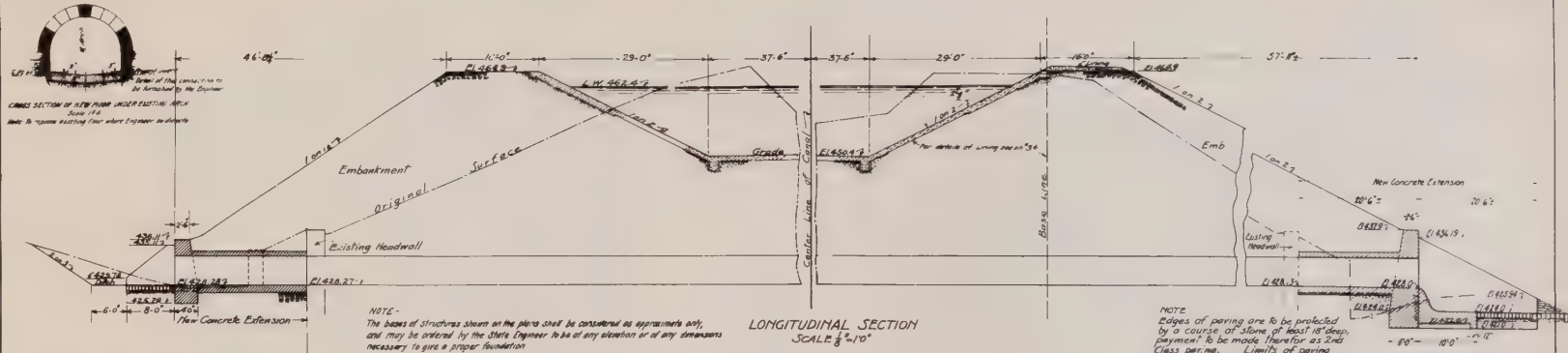
Entrance under Construction

Concrete wall around entrance restricts flow to two 30" openings until water rises over top of wall.



Exit and New Embankment

Manhole on left contained devices to measure embankment settlement.



SEE CHANGES
PAGE 190

REPLACED IN 1975 UNDER CONTRACT M75-2 WITH
NEW 84" DIA. CONCRETE PIPE AT STA. 2064+80.

Contract No. 63.

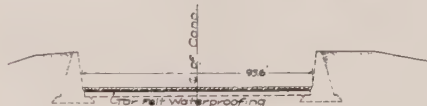
Erie Canal Section 9
Between west line of Wayne County and Kings Bend
DETAIL PLANS FOR CULVERT AT
STA. 2070+28-2065+60
OLD CULVERT NO. 29
Scale as indicated

Examined and approved
11/11/83
Regional District Engineer
Nov 10 1983

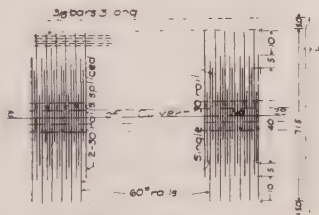
MADE BY *Barbary*
TRACED BY *11/11/83*
CHECK BY *11/11/83*
END CHECK BY *11/11/83*



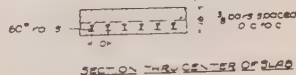
LAYOUT
Scale 1"=100'



CROSS SECTION THRU SLAB
Scale 1"=20'



PLAN SHOWING METAL REINFORCEMENT
Scale 1"=20'

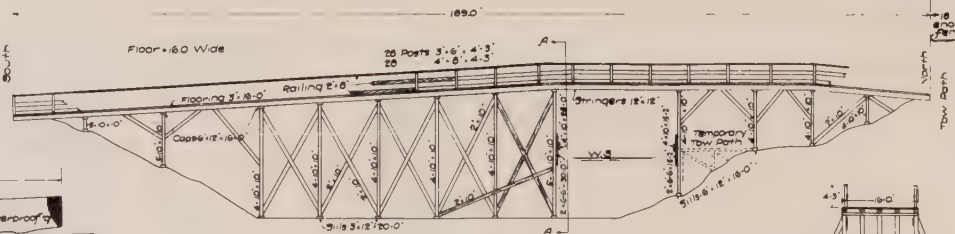


SECTION THRU CENTER OF SLAB
Scale 1"=20'

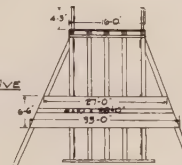


PLAN OF THE FELT WATERPROOFING
Scale 1"=50'

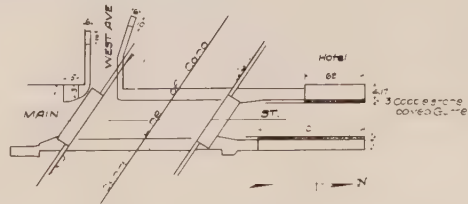
| SUMMARY OF ITEMS | | | |
|----------------------------------|---------------------------|----------|--------|
| LOCATION | ITEM | MEASURE | AMOUNT |
| Bushnell's Basin Trough | Rein Concrete | Cu Yds. | 422 |
| | Top Felt Waterproofing | Sq. Ft. | 12,902 |
| | Reinforcement Metal | Lbs | 80,444 |
| Temporary Bridge at Monroe Ave | (Y.R. or D.F.) | | 44 |
| | Saved Lumber M.P. or M. | | |
| Main St. Lift Bridge at Fairport | Portland Cement Sidewalks | Sq. Ft. | 2,450 |
| Main St. Lift Bridge at Fairport | Cobble Stone Paving | Sq. Yds | 125 |
| Knapps Bridge South Approach | Wooden Fence | Lin. Ft. | 400 |



LONGITUDINAL SECTION OF TEMPORARY BRIDGE AT MONROE AVE
Scale 1"=10'



SECTION A-A
Scale 1"=20'



LAYOUT OF MAIN ST. WEST BRIDGE, FAIRPORT
Scale 1"=50'

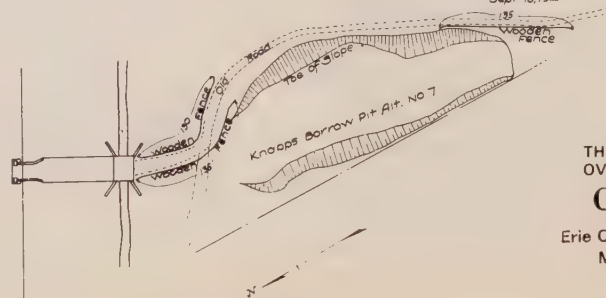


SECTION OF SIDEWALK
Scale 1"=20'

Examined and approved by
J. Williams
Division Engineer
Sept. 10, 1914



DETAIL OF FENCE
Scale 1"=20'



LAYOUT OF SOUTH APPROACH, KNAPPS BRIDGE
Scale 1"=50'

THROUGH FLOOR REINFORCED
OVER CULVERT NO. 29

Contract No. 63.

DETAIL SHEET

ALTERATION NO. 15

Erie Canal

Section 9

MISCELLANEOUS DETAILS

Scales as indicated

Examined and approved

J. Williams
Sept. 23, 1914
Special Deputy State Engineer

Culvert #30 508' of Twin 12' Wide x 9' High
Concrete Boxes

PAGE 191

See History-Barge Canal Construction
Bushnell Basin to Cartersville



Entrance
Headwall and wingwall areas in good condition



Exit
Deicing chemicals and freeze-thaw action have caused cracks and scaling on top of headwall. Wingwalls in good condition, except for a few cracks at the ends.



Deep eroded or honeycombed area at south end of west barrel



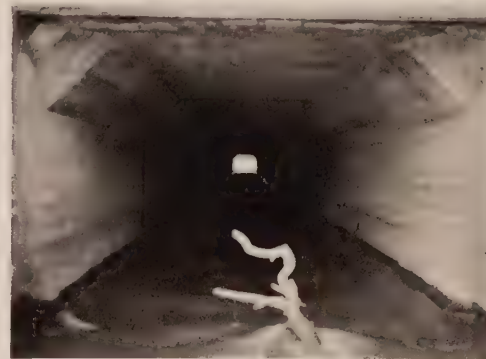
Looking Downstream from Exit
Note bank erosion and attempts to stop it.



East Barrel - Looking South or Upstream From Exit



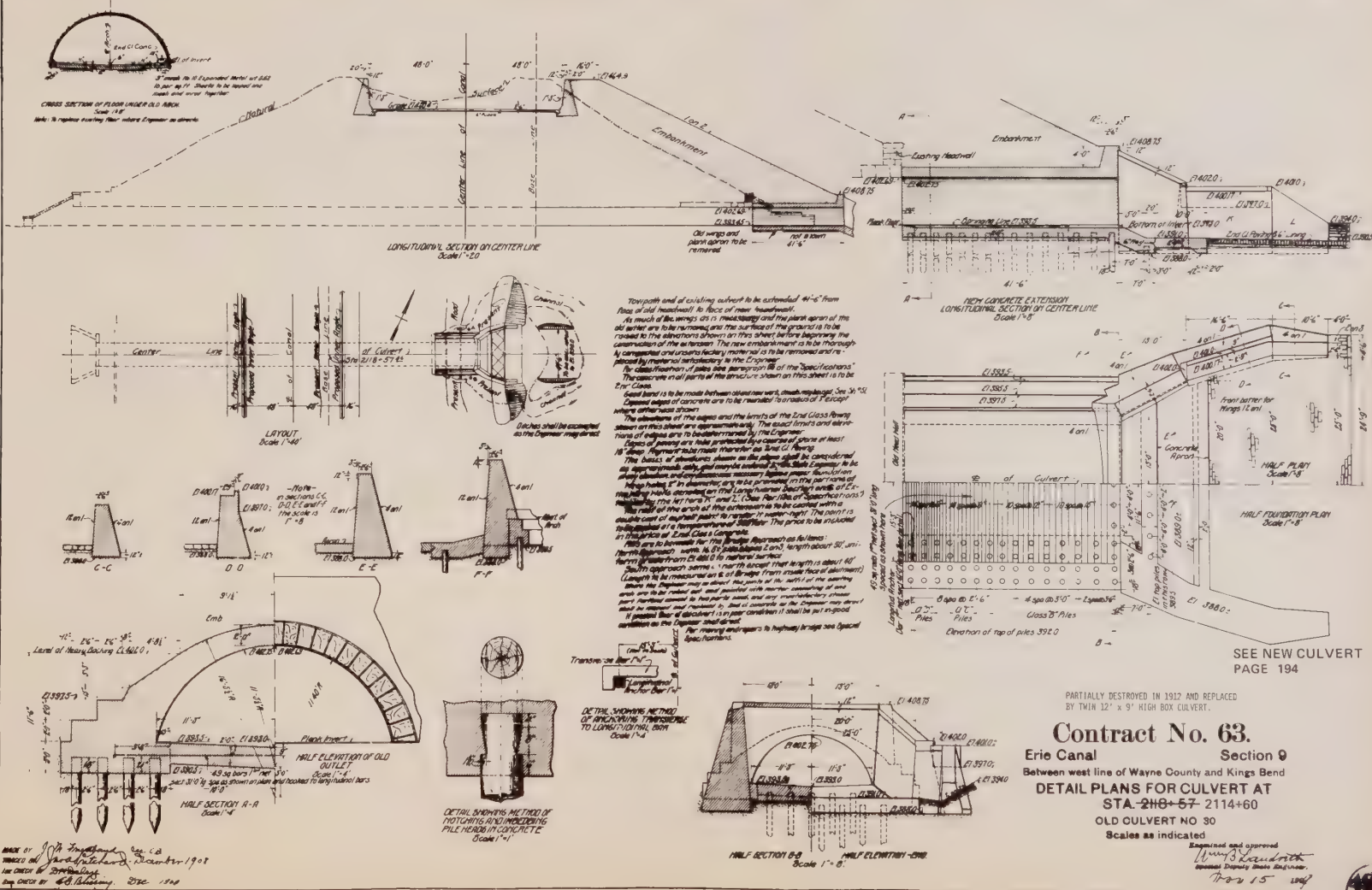
South End of West Barrel
Slow seepage at scaled or
eroded joint area.

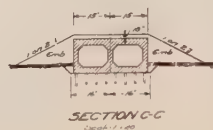
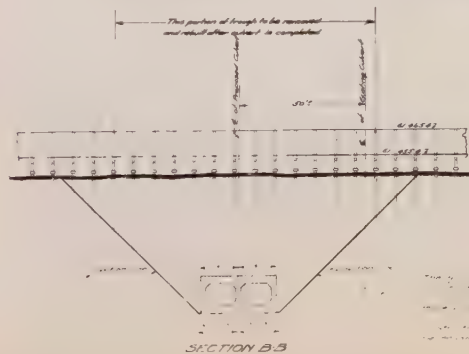
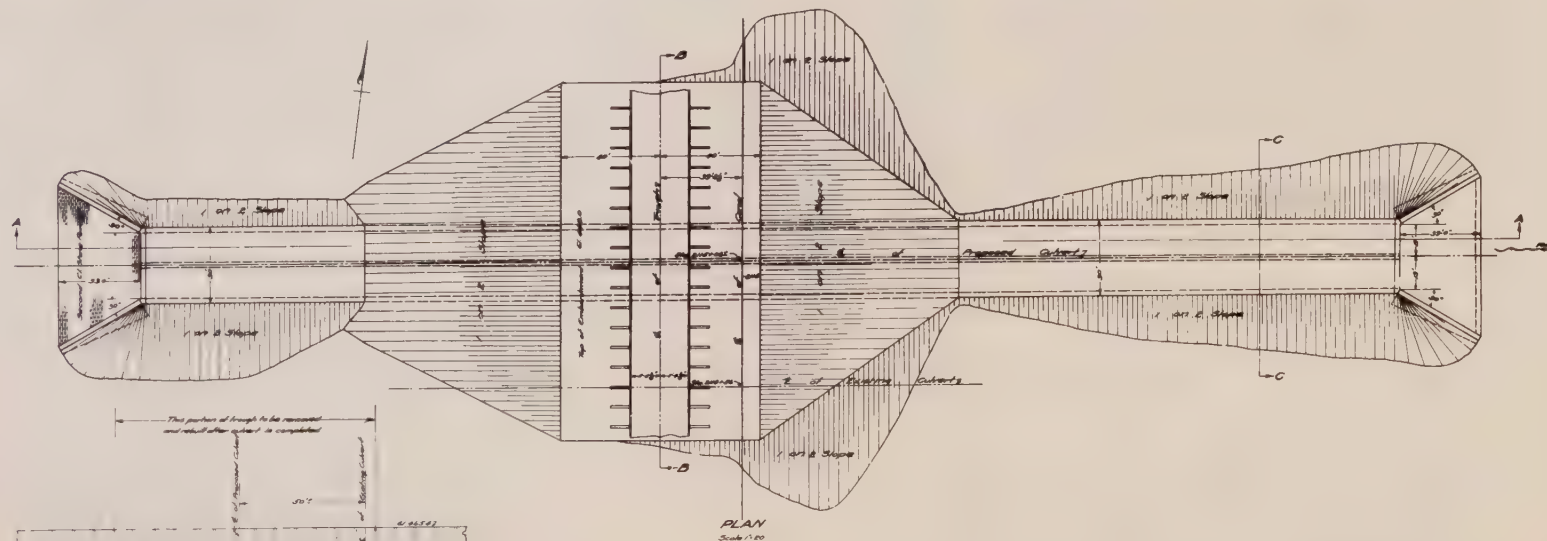
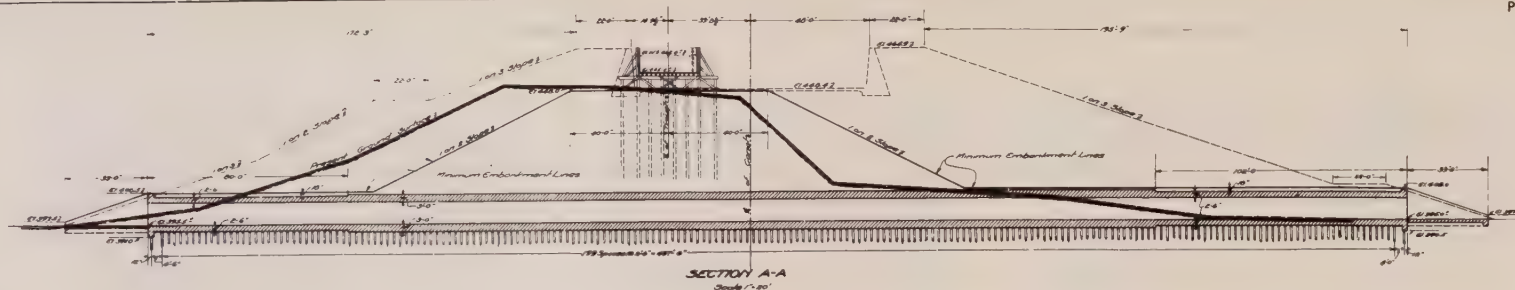


West Barrel - Looking South or Upstream From Exit

One construction joint near middle of barrel open 3/4-1". Two deep scaled or eroded areas - 4' x 5' area and 1½' x 30' long area on east wall 150' from south end or entrance. These eroded areas may have been honeycombed areas that were patched during construction and have scaled away. Many isolated areas where concrete cover has popped off due to rusting "high" steel. A few bars were heavily rusted. Barrel generally in good condition.

One construction joint near middle of barrel open 3/4-1". Joints mainly near barrel ends have a little seepage. Very little seepage elsewhere. Most seepage starts a foot or two above triangular concrete floor corners. Many isolated areas where concrete cover has popped off due to rusting "high" steel. A few bars were heavily rusted. 1' x 2' eroded or scaled area 50' from south end or entrance on west wall. Barrel generally in good condition.





CULVERT NO. 30
STA. 2115+20

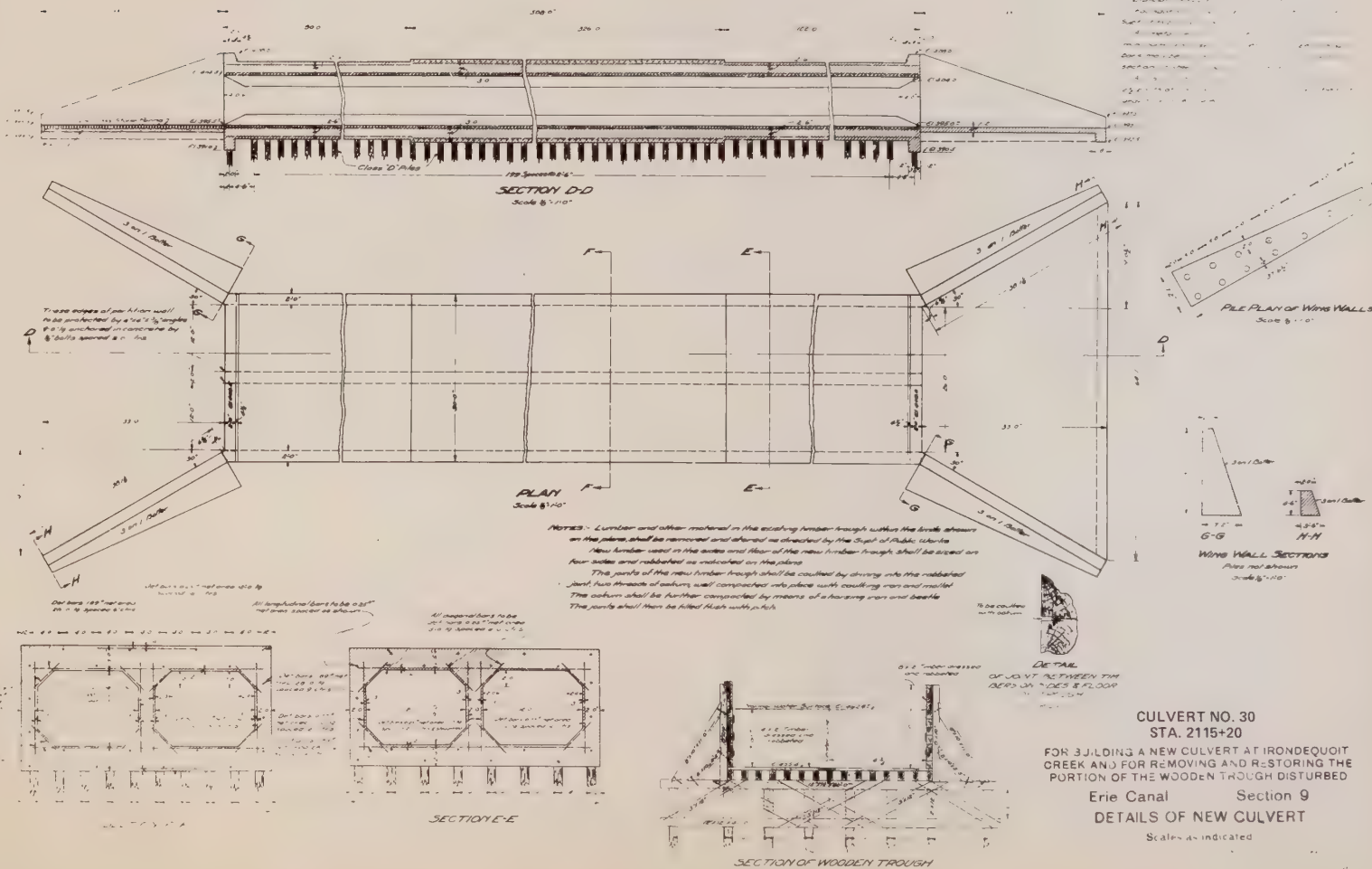
FOR BUILDING A NEW CULVERT AT IRONDEQUOIT
CREEK AND FOR REMOVING AND RESTORING THE
PORTION OF THE WOODEN TROUGH DISTURBED

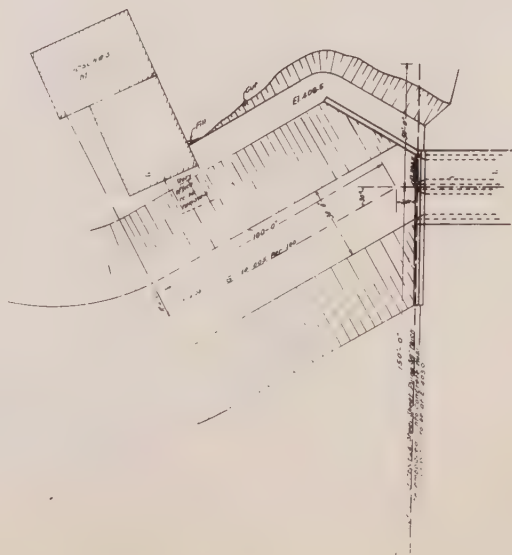
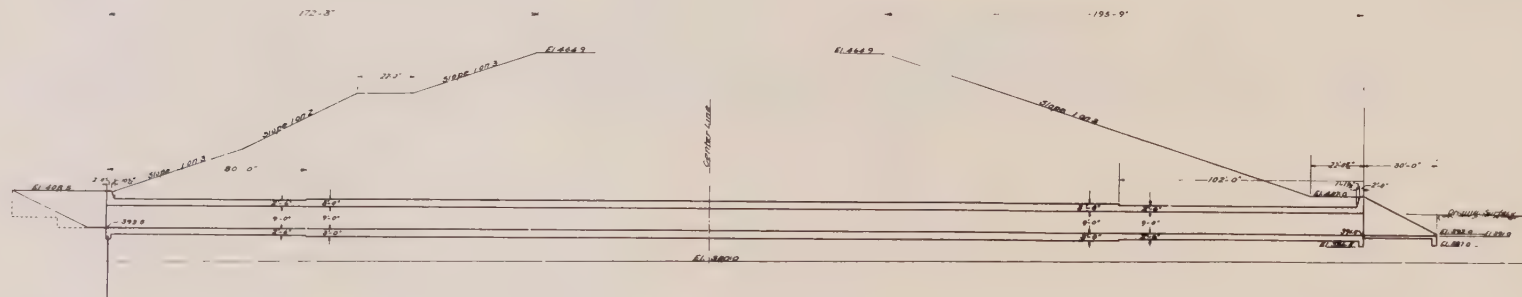
Erie Canal Section 9
PLAN, PROFILE AND SECTIONS OF
NEW CULVERT

Scales as indicated

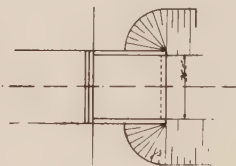
Reviewed and approved

Special Service Unit Engineer





Note:-
Bottom and Sides of Ditches to be
protected with 2' Thickness of
4th. class Rip Rap Voids to be filled
with Gravel or Concrete



CULVERT NO. 30
STA. 2115+20

FOR BUILDING A NEW CULVERT AT IRONDEQUOIT CREEK AND FOR REMOVING AND RESTORING THE PORTION OF THE WOODEN TROUGH DISTURBED

Erie Canal Section 9

FIG. 2. SECTION SHOWING MODIFICATION OF
INLET CHANNEL AND FLOW

5. 410 1 x 20'

Culvert #30½ 598' of 2' x 2' Concrete Box
116' of 6" Cast Iron Pipe

Not Inspected

See History - Barge Canal Construction
Bushnell Basin to Cartersville



Entrance in Foreground under Sanitary Landfill

On the north side of the canal at the west end of the Irondequoit Trough is the Town of Perinton Sanitary Landfill Site. It is doubtful whether anyone discovered the culvert entrance prior to land fill operations as it would have been hidden by brush.

A thorough search was made for the culvert exit (6" cast iron pipe encased in 1' of concrete) on the south side of the Irondequoit embankment at the toe of slope, but only an old roadway culvert drainage channel with a concrete endwall was found.

The culvert no longer serves any purpose and should be well protected in the embankment from deterioration. However, this culvert should not be forgotten as it is still a hollow structure capable of carrying water.

Culvert #31 (Dive) 192.5' of 42" Cast Iron Pipe +
135' Extension

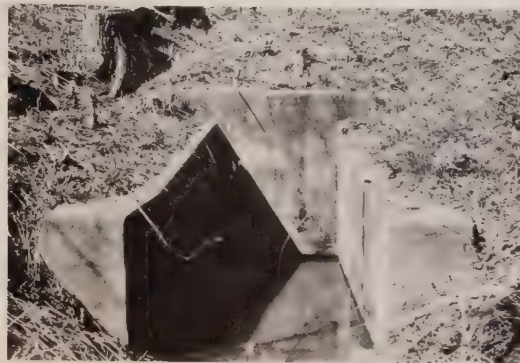
PAGE 197

Not Inspected



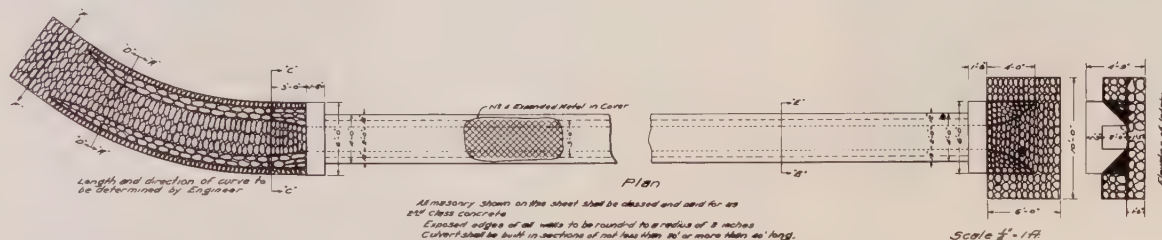
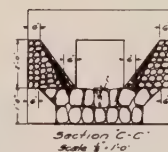
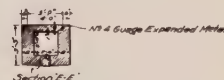
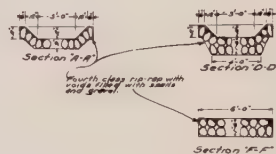
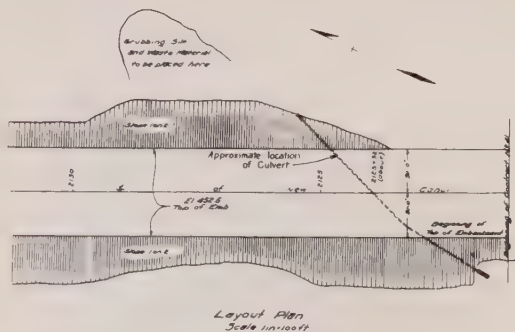
Entrance

Headwall and wingwalls were in fair condition. There were many cracks, but the concrete sounded solid.



Exit

Headwall and wingwalls in good condition, except for many cracks on right wingwall.

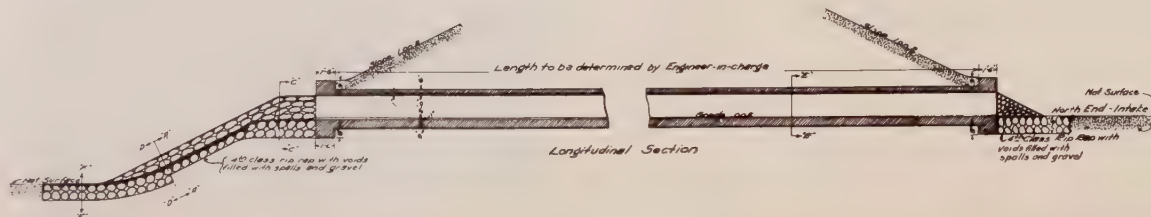


As masonry shown on the sheet shall be classed and used for as 2nd class concrete.

Exposed edges of all walls to be rounded to a radius of 2 inches.

Culvert shall be built in sections of not less than 20' nor more than 40' long, but the metal reinforcement shall extend not less than 1 ft beyond joints to bond into its adjoining section.

The location of floor of culvert will be determined by the Engineer, and will depend on the amount of soil described on the north side of the embankment.



SEE CHANGES
PAGE 400

CULVERT NO. 30½
Contract No. 41.

Erie Canal Section 9

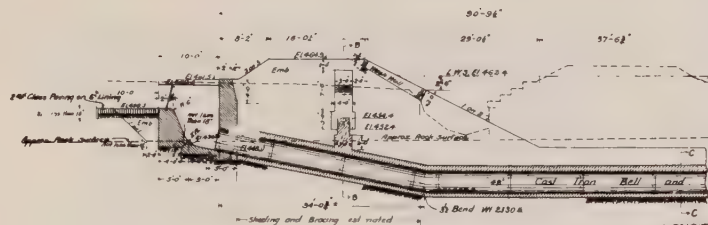
At Irondequoit Creek Crossing
**DETAILS OF CULVERT UNDER
EAST EMBANKMENT**

Scales as indicated

Detail sheet furnished in accordance
with note on sheet 3 of plans and paragraph
3.3 of Specifications - Contract No. 41.

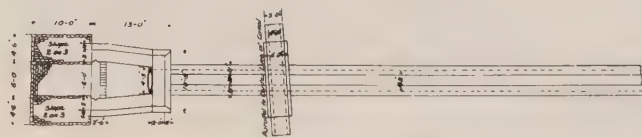
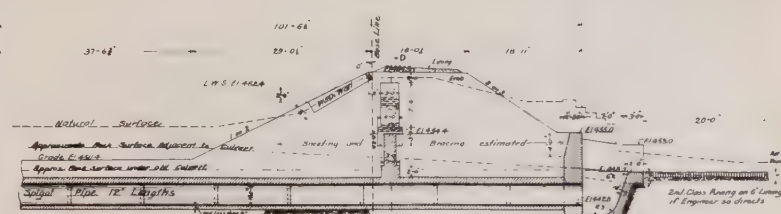
Examined and approved

Wm. B. Smith
Chief Engineer



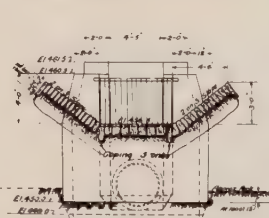
LONGITUDINAL SECTION

Scale 1"=8'



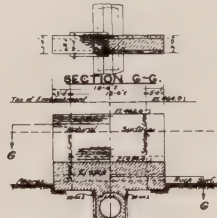
PLAN

Scale 1"=8'



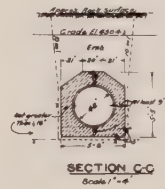
ELEVATION OF SOUTH END

Scale 1"=8'



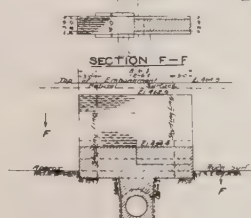
SECTION G-G

Scale 1"=8'



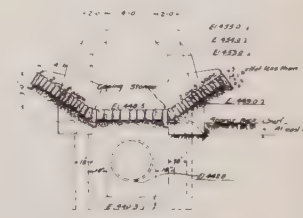
SECTION C-C

Scale 1"=8'



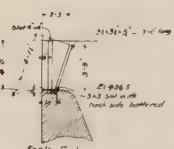
SECTION D-D

Scale 1"=8'



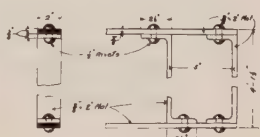
ELEVATION OF NORTH END

Scale 1"=8'



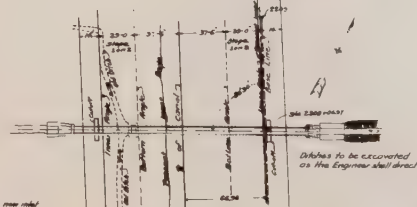
DETAIL OF GRATING

Scale 1"=8'



SECTION B-B

Scale 1"=8'



LAYOUT PLAN

Scale 1"=8'

Ditches to be excavated as the Engineer shall direct.

Note: The bases of structures shown on this plan shall be considered as approximate only, and may be modified by the State Engineer in the use of any alterations or of any dimensions necessary to give a proper foundation.

Exposed edges of completed structures are to be reinforced to a radius of 1" unless otherwise shown.

Excavations for the foundations of the culvert to be made, where possible, to suit lines of concrete only, and concrete, under such conditions, to be deposited without disturbance.

Edges of End Class Paving and changes in slopes to be protected by a covering of stone or basal 12" class paving in place, and payment to be made thereon as End Class Paving.

Equal limits and elevations of edges of End Class Paving are to be determined by the Engineer.

How ditches, connecting the old ditches with the new main one, to be excavated from the top of the main embankment. The same method, size and slope of sides of the ditches are to be determined by the Engineer.

Screen for the location of the angle by 1/2" shown and approved (not shown) to be painted as per Bridge Specifications.

Payment for back and screens to be made under structure.

Shoring and bracing to be used in excavating through old ditches only if so ordered by the Engineer.

Contract No. 63.
Erie Canal Section 9
 Between west line of Wayne County and Kings Bend.
DETAIL PLANS FOR CULVERT AT
STA. 2208+07-2202+35
OLD CULVERT NO. 31
 Scales as indicated

Examined and approved
Wm. J. Macdonald
 Special Deputy State Engineer
 Nov 15 1909

MADE BY H.C. Allen, Engineer
 TRACED BY C.O. Burrier
 1st CHECK BY S.D. Oct 20-09
 2nd CHECK BY H.C. Nov 10-09

Not Inspected



Entrance

This is the entrance to the railroad culvert. After approximately 75', the floor slopes down and the canal culvert begins. The stone block arch railroad culvert and the beginning of the canal culvert appeared in good condition. Some heavy seepage was occurring at the joint between the two sections.



Exit

Headwall and wingwalls appeared in good condition. In 1976, this end of culvert is to be lengthened due to embankment widening.

Not Inspected



Entrance

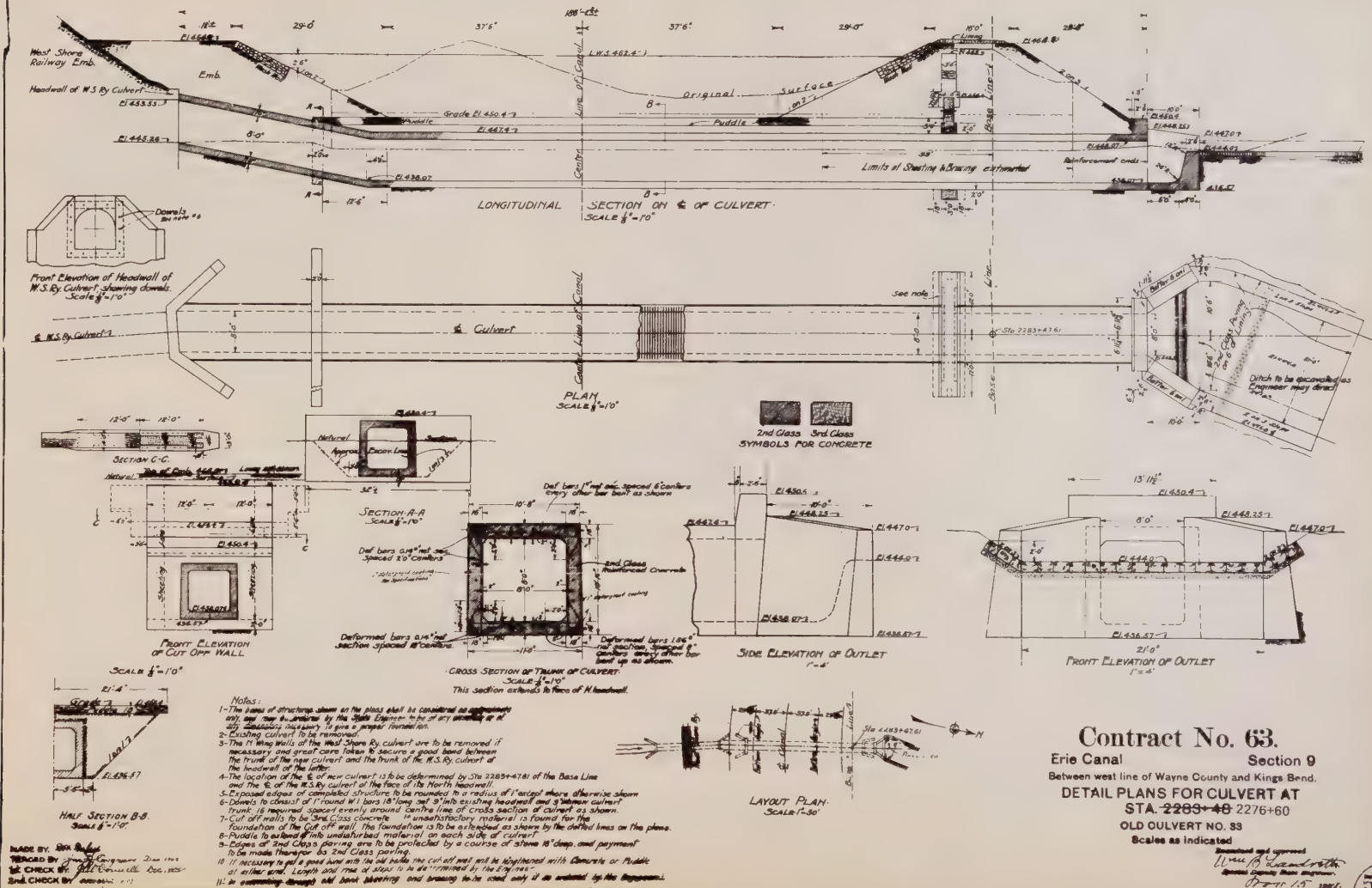
Top of headwall deeply scaled. Many efflorescent covered cracks exist on rest of exposed wall.

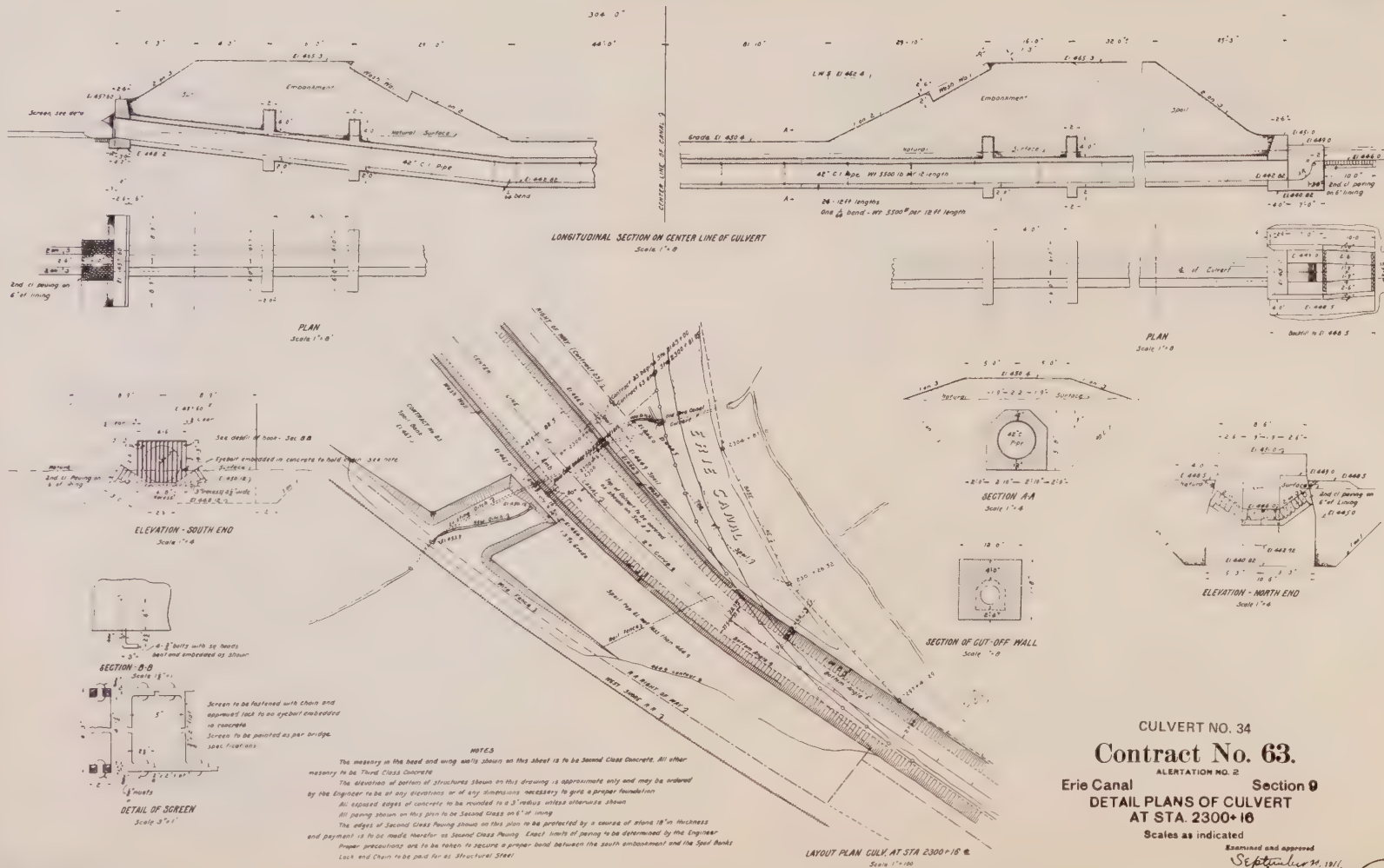


Exit

Headwall appeared in good condition. Left wingwall was undermined, heavily cracked and ready to fall apart. Right wingwall was half missing and rest was mostly fractured concrete.

A short distance downstream is a small stone block arch culvert under the old Erie Canal. This culvert appeared in good condition from both ends.





CULVERT NO. 34

Contract No. 63.

ALERTATION NO. 2

Erie Canal Section 9

DETAIL PLANS OF CULVERT
AT STA. 2300+10

Scales as indicated

Examined and approved

September 30, 1911
Chas. B. Smith
Special Deputy State Engineer



Entrance

Headwall and wingwalls in good condition. Some spalling on bottom front of center pier wall. One 6" deep spill on left wingwall along a vertical construction joint. No cracks noted.



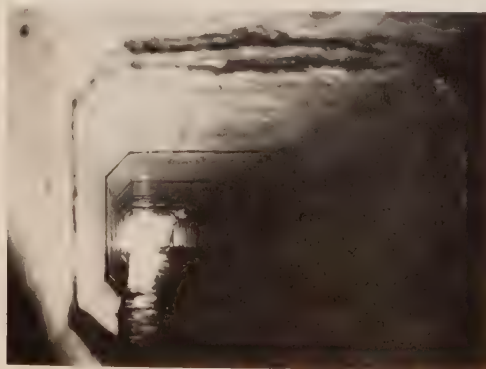
Exit - East Wingwall

Top of wingwall has moved inward 1'



Exit

Headwall has scaled in center area. Low end of right wingwall has scaled away 1" deep and bottom 3' was all cracked. Three 10" syphons flow from canal.



West Barrel - Looking North Toward Exit

East Barrel - Most of the joint areas were scaled 3-4" deep and 1' wide on each side of the joint. One joint near middle of barrel was leaking a constant drip size stream. The 2nd and 3rd joints in from the north or exit end were the worst. Scaling was 1-2' wide and 6" deep on each side of the joint. The ceiling had 3 areas that contained many efflorescent covered cracks and soda straws, but the areas were mostly dry.

West Barrel - Conditions in this barrel were similar to east barrel (joint deterioration and cracks). Steady drip size streams flowed through 4 of 5 joint areas.

The majority of the concrete was in good condition, but joint and other repairs are needed.

TYPE OF JOINTS

Joint along bars buried in culvert to be constructed of reinforced and less than 20 ft nor more than 60 ft. Sections between joints shall be built as monoliths.

SECTION C-C
Scale 1"=4'-0"SECTION D-D
Scale 1"=4'-0"SECTION ALONG LINE A-A
Scale 1"=8'-0"PLAN
(Earth removed except at ends)
Scale 1"=8'-0"SECTION E-E
Scale 1"=4'-0"SECTION B-B
Scale 1"=8'-0"

(Concrete and reinforcement of section B-B is same as section B-B except elevations are as shown)

SECTION OF CULVERT SHOWING METHOD OF REINFORCEMENT
Scale 1"=8'-0"GENERAL LAYOUT
Scale 1"=50'-0"

The location of deformed bars may be modified should they conflict with joints. All loose material against the wall and on the outside north beneath the structure shall be removed and backfilled to the proper elevation with an embankment. All material shown on this sheet shall be classed and paid for as second class concrete. The radius of all walls are to be rounded to a radius of 4" unless otherwise shown. All joints or decentering placed on top of the culvert and within 150' of the side to be placed as embankment except at ends as shown.

Def bars 20#
net sec placed 2'0" c/c and 10'0" from face of concrete

Def bars 20#
net sec placed 2'0" c/c and 10'0" from face of concrete

Def bars 20#
net sec placed 2'0" c/c and 10'0" from face of concrete

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CULVERT NO. 35

Contract No. 23.

Erie Canal

Section 9.

From Kings Bend to the Genesee River.

ALLEN CREEK CULVERT STA. 2253+40.55

Scales as indicated.

Examined by J. H. Smith
J. H. Smith, Jr., Engineer
Professional Engineer, State of New York



Entrance

Headwall contained a few cracks, but headwall and wingwalls were generally in good condition.



Extension Exit

Headwall had cracked vertically over top of arch, but the concrete was in good condition. This headwall is some 235' from where the culvert under the canal emerges into a manhole. This extension was in good condition.



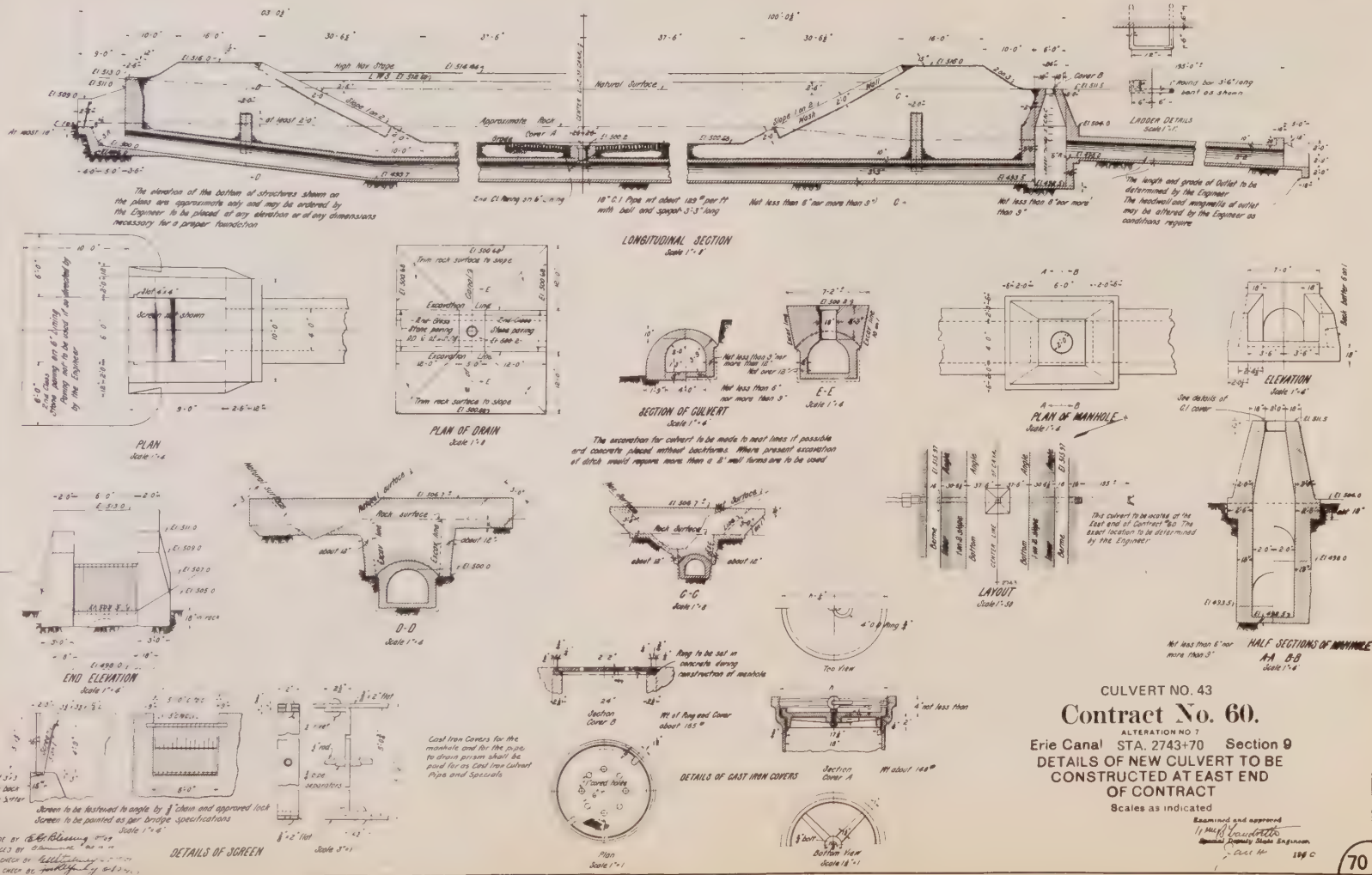
Canal Area Over Culvert 43

In the Spring of 1976, water was seen spouting up into nearly drained canal. Manhole exit had plugged with debris and water rose 5' over exit or 3' above level of canal water. Pressure caused drain cover at bottom of canal over culvert to blow out. During week of April 26-30, area was sandbagged off, but high water in canal from rains inundated area. Earth cofferdam was then built and mud removed until drain was found.



Culvert 43 Welded Drain Cover

Tilted drain cover was put back into position and shims put on top of recessed cover. Holes were drilled into existing concrete pad and bolts anchored. Steel plate was placed over cover and angle iron over steel plate. Plate and iron were welded together. Angle iron was welded to anchor bolts.



Culvert #44 132' of 42" Cast Iron Pipe
72.5' of 4' Wide x 3' High Concrete Arch
36' of 36" Corrugated Metal Pipe Recently
placed in Culvert Entrance

PAGE 207



Entrance

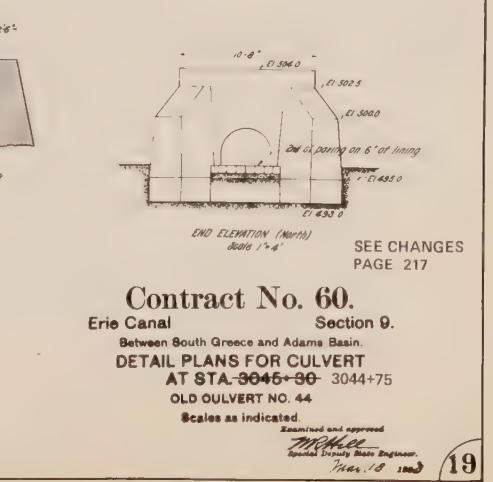
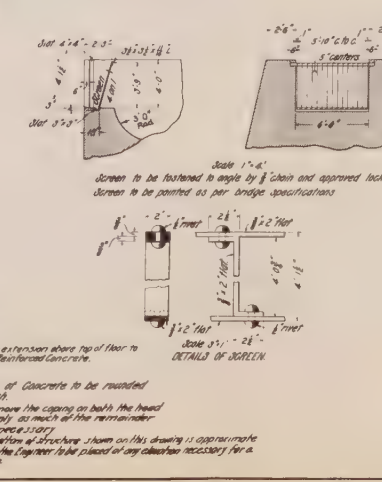
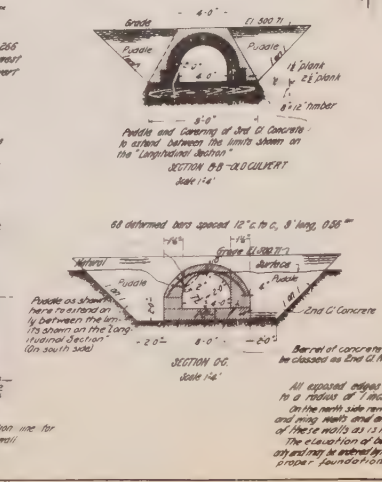
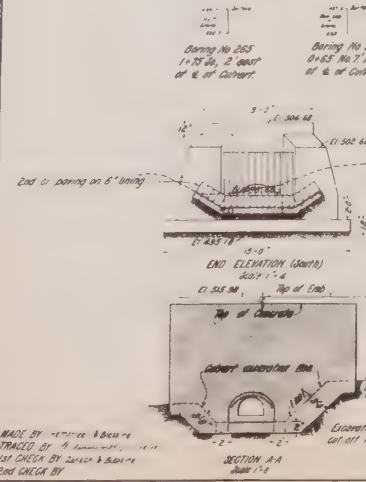
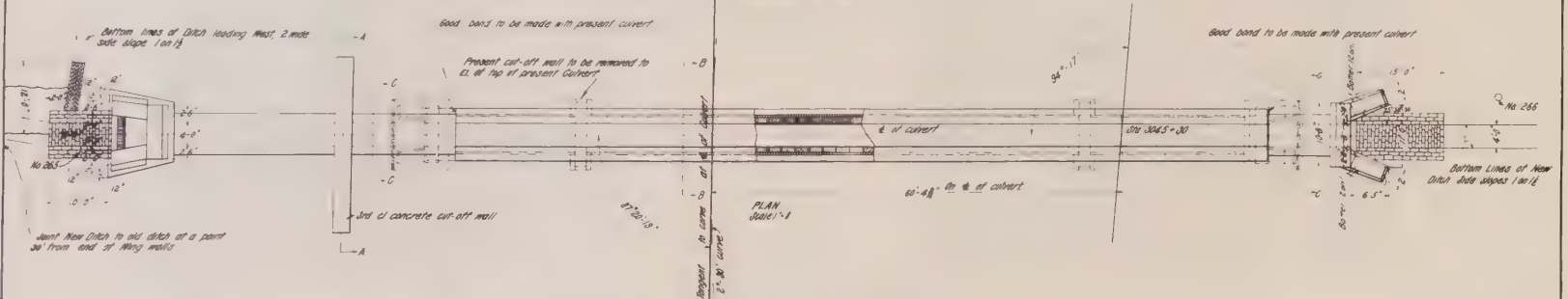
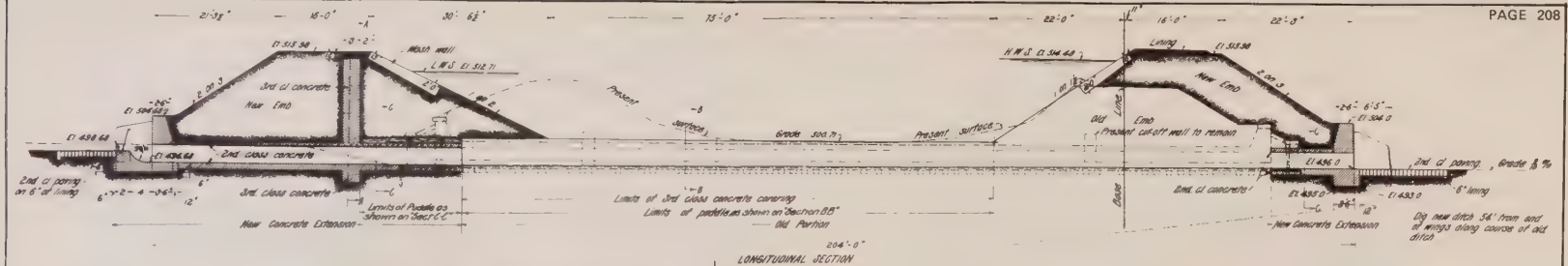
Concrete arch behind headwall failed. Area excavated and 3-12' lengths of 36" corrugated metal pipe installed in Spring of 1975. Deteriorated headwall and wingwalls were faced with steel plates.



Exit

Headwall and wingwalls seemed to be patched with mortar. 1' deep erosion at wingwall waterline

From south to north (entrance to exit) - Last section in of corrugated pipe has been cut all along the top, possibly to squeeze pipe to smaller diameter, but there was a 3-4" gap between the pipe and the circular arch wall. Next 10' is concrete arch, 70% of which has scaled areas up to 1' deep. Cast iron pipe then begins. Two 5" diameter holes one on each side of joint between 2nd and 3rd pipe sections, patched with 10" square steel plate. One patch has fallen off (steel plate is on outside also). Between 3rd and 4th sections, roots and 3 constant drip size leaks. Last 15' concrete arch. 1 scaled area 6" deep above the water line and 1 scaled area 3" deep at the water line. Repairs are needed.



Contract No. 60.
Erie Canal Section 9.
 Between South Greece and Adams Basin.
DETAIL PLANS FOR CULVERT
AT STA. 3045+96- 3044+75
OLD CULVERT No. 44
 Scales as indicated.
 Examined and approved
John E. ...
 Special District State Engineer.
 June 18 1963



Entrance

Headwall and wingwalls were in good condition. Wingwalls have some surface cracks.



Exit

Headwall was in good condition. Wingwalls were in fair condition with a number of cracks on the surface.



Hole behind entrance headwall filled with rock.

From north to south (exit to entrance) 1st 4 foot section was extensively scaled up to 1' deep. Ground water leakage at 1st joint. Next 10' long and 4' long concrete sections were in good condition. Then cast iron pipe was in good condition. Midpoint in the pipe, there was a 10" square overhead plate patch with water flowing from behind it. 50' from south end, 1st 6' long concrete section was in good condition. 2nd 8' long section had its joint area scaled 1' wide and 6" in depth. All the way around arch, ground water was leaking in. 3rd 8' long section in good condition. Then joint area scaled 1' wide and 3" deep. Last 20' of arch in good condition until headwall reached. Rear 2' of 4' thick headwall badly eroded. A 1' x 4' hole was patched with loose sheet metal. Embankment can be seen behind patch. A 4' wide x 6' long x 3' deep hole filled with rock existed behind the headwall. Repairs are needed.

Not Inspected



Exit

Headwall in good condition. A few cracks on wingwalls. Culvert exit and channel filled with sand.

From north to south (exit to entrance) - The 1st joint looked good. 35' from the north end, between 1st and 2nd joint, a crack goes around whole culvert. There was staining present, but no leakage. 2nd joint was stained and leaking. The next 50' section had a crack in the middle and 3 spots that were dripping. There were approximately 6 cracks with heavy efflorescence about 10' from the end of this 50' section. 3rd joint has about 6 steady dripping areas. 4' south of joint was an 8" steel plugged pipe. 4th joint has 3 dripping areas. Cracks toward the middle of this 50' section also dripping. Last section has 2 intermediate cracks that were dripping. Culvert in general was in good condition. Floor was made up of transverse wood timbers with approximately 1' of concrete between the timbers and 1" of concrete cover. Most of the concrete cover near the entrance was missing. A concrete encased sewer pipe was along the west side of the culvert. Approximately 50' from the exit, the culvert slopes up about 1' in 10'. The plans do not show this change.



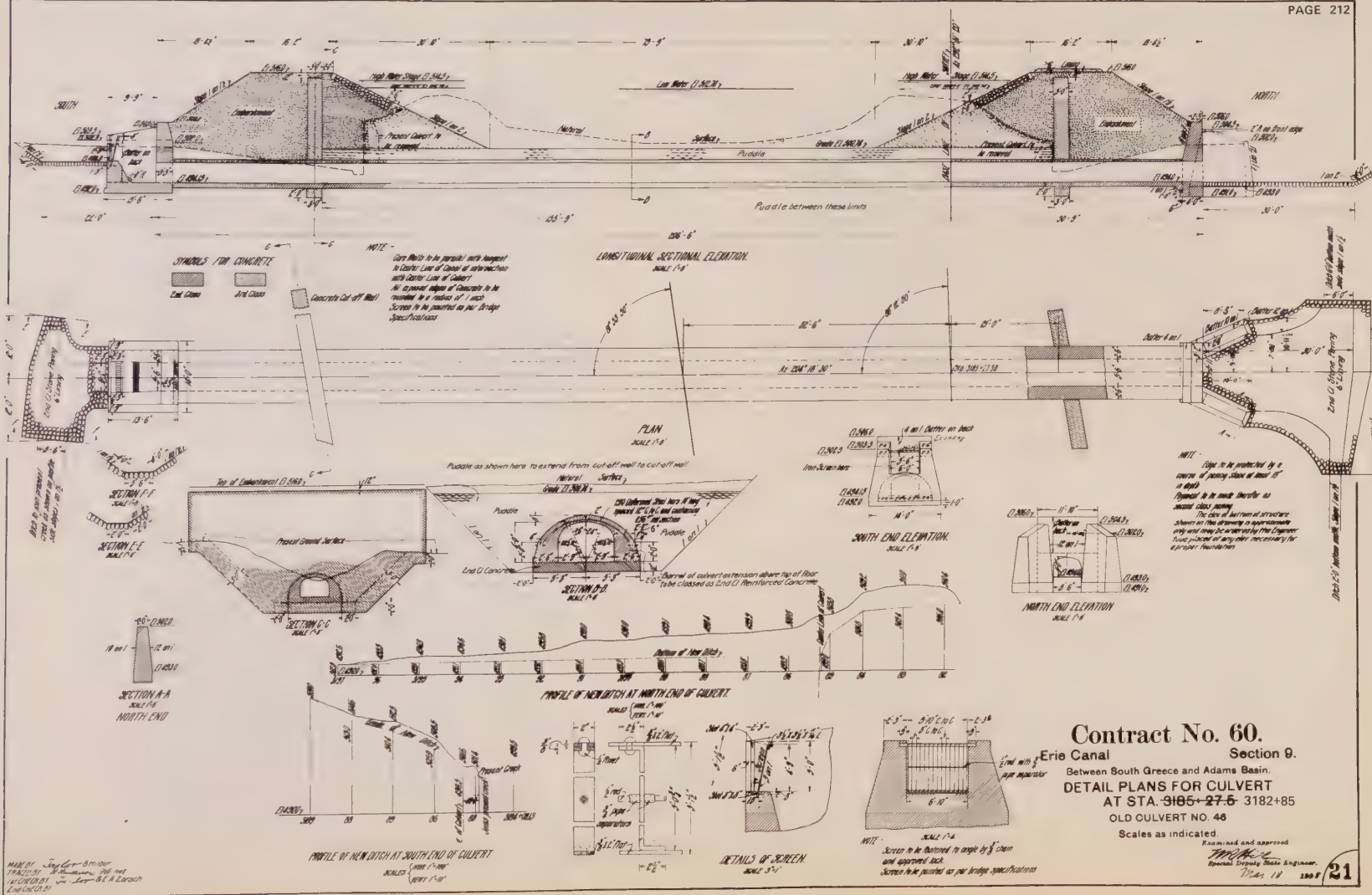
Entrance

Headwall and upper sections of wingwalls cracked, delaminated and covered with efflorescence.



Exit

Headwall and left wingwall in good condition. Right wingwall had a lot of surface cracks and efflorescence.



Contract No. 60.

Erie Canal Section 9.

Between South Greece and Adams Basin.

DETAIL PLANS FOR CULVERT

AT STA. 3185+27.5 3182+85

OLD CULVERT NO. 48

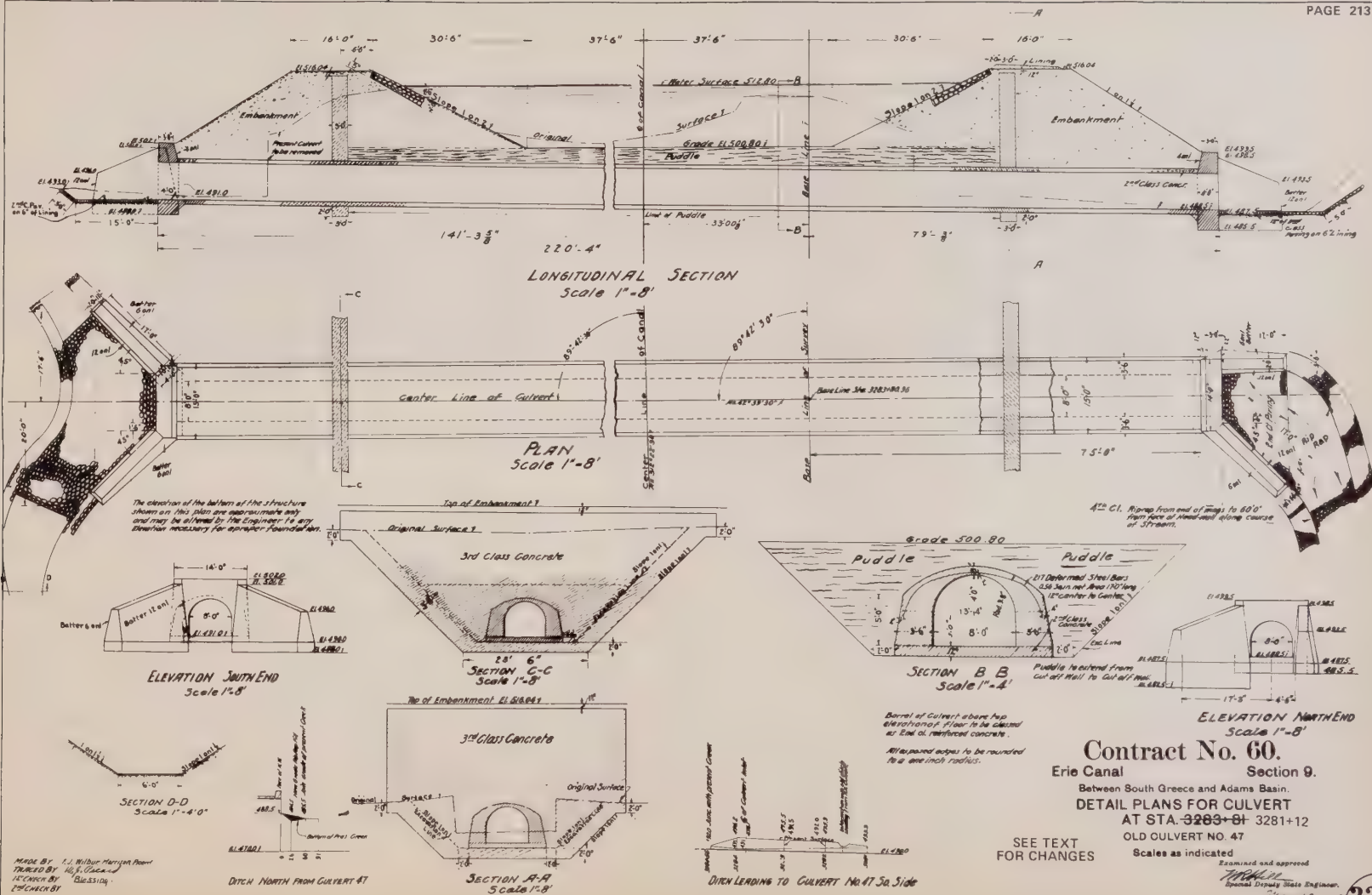
Scales as indicated.

Examined and approved

Mark

Special Deputy State Engineer

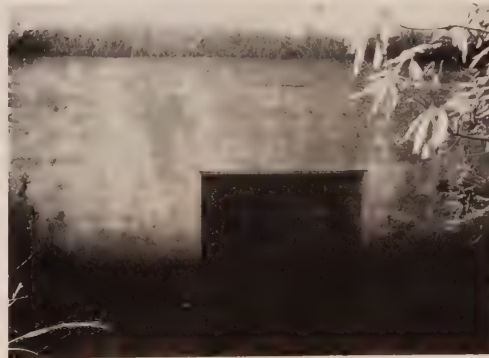
11/25/85





Exit

Some scaling on headwall and top of wingwalls, but in good condition. The culvert was not originally built as a dive. Apparently, this work was done to widen the overhead road in 1955 (date on headwall). The 6' X 6' concrete box goes in 10' to a debris filled well.



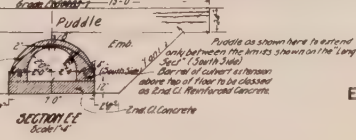
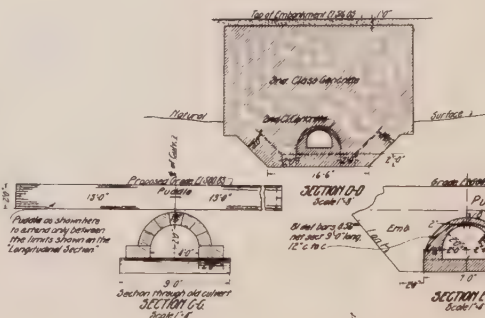
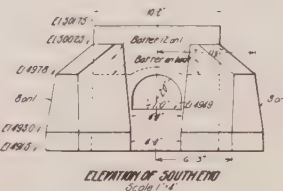
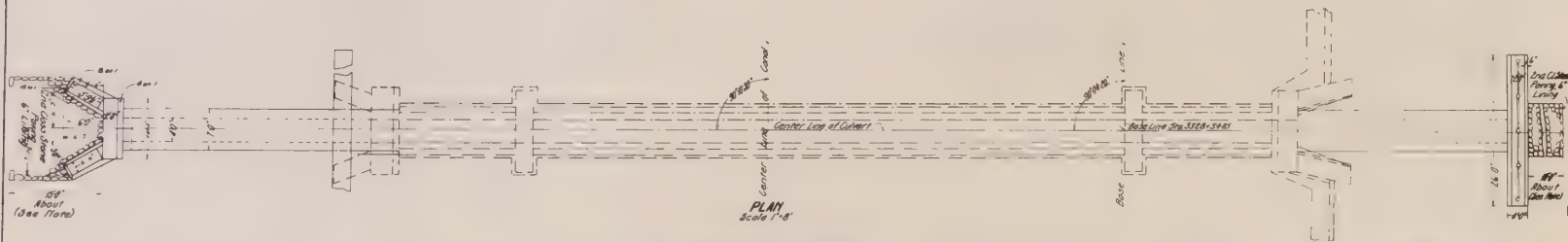
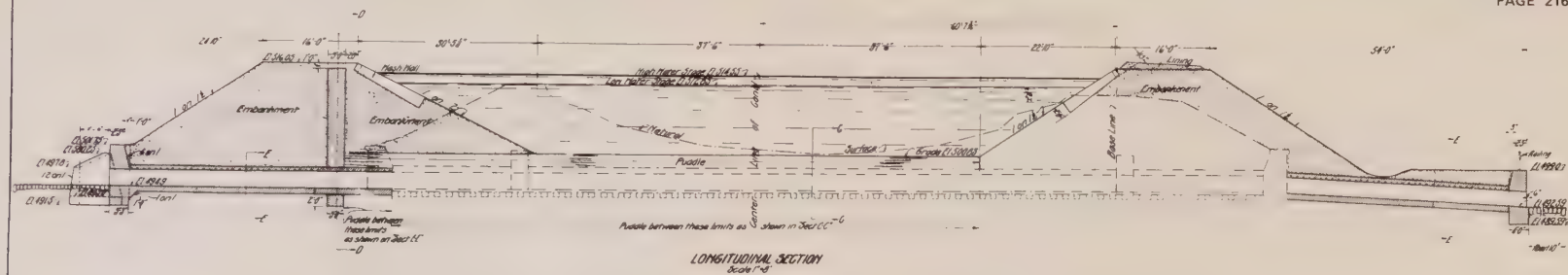
Exit

Some headwall surface scaling, but in good condition. Roadway apparently widened in 1955 and culvert extended.

Entrance

Headwall was in very poor condition with a vertical crack through it. Also, there was a 4' wide by 2' high by 8" deep face area missing. Only the top 1½' of headwall was intact. Wingwalls were in fair to poor condition.

From north to south (exit to entrance) - 5' wide by 4' high by 20' long new concrete box in good condition. Next is a 4' high, 5' wide concrete arch. A 1" gap exists between the two. 5' into the arch, there was a scaled area 1' wide, 2' long and 8" deep. 15' into the arch, a 1-1½' wide by 8-12" deep scaled joint area was leaking heavily. 20' into the arch, there was a 1' by 2' by 8" deep scaled area. Next joint leaks, but no deep scaling. 8' from beginning of cast iron pipe was a dripping area. Adjacent to cast iron pipe was a scaled area 3' X 1' X 8" deep. Cast iron pipe has an 18" drain at the center. Slow seepage in cast iron pipe joints, but pipe was in good condition. The concrete arch at the south end of the culvert has approximately 6 scaled areas 8"-1' in depth and ranging in size from 2-6 square feet. Repairs are needed.



NOTES

All concrete shown on this drawing to be 2nd class with the exception of the cut-off wall which is to be 3rd class.
All exposed edges of concrete to be rounded to a radius of 1".
A good bond is to be made between the old and new work.
The old head and wing walls on the south side are to be removed entirely.

Only so much of the old head and wing walls on the north side is to be removed as is necessary.

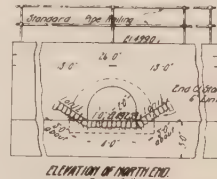
All paving shown on this drawing is to be 2nd class with 6" of lining.

The elevation of bottom of structure shown on this drawing is approximate; it only may be ordered by the Engineer to be placed at any elevation necessary for a proper foundation.

The limits of the paving and the elevation of the edges to be determined by the Engineer.

Edges to be protected by a course of paving stones at least 18" in depth. Payment to be made therefor as 2nd Class Paving.

For detail of Standard Pav. See Spec. 17.23



SEE CHANGES
PAGE 217

Contract No. 60.

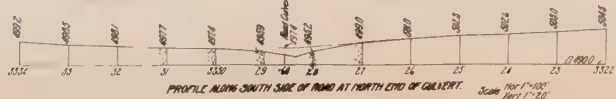
Erie Canal Section 9
Between South Greece and Adams Basin.
DETAIL PLANS FOR CULVERT
AT STA. ~~3328+34~~ 3325+18
OLD CULVERT NO. 49

Scales as indicated.

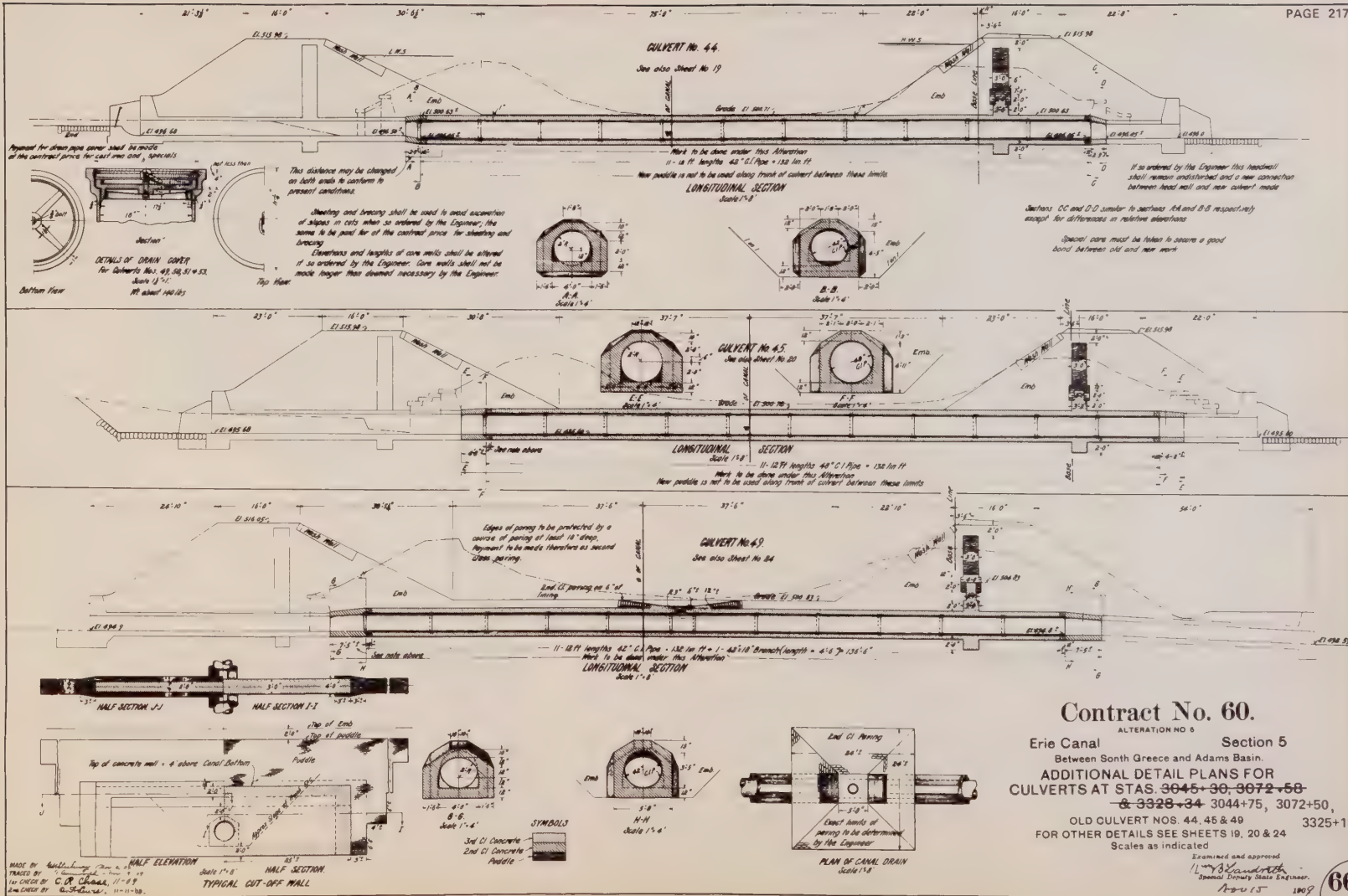
Examined and approved

W. H. Hall
Special Deputy State Engineer.

Mar. 18, 1904



MAILED BY - 1st Lt. Miller & Morrison
TRACED BY - 1st Lt. Leary, Feb - 1908
1st CHECK BY - Taylor & E. Zorsch
2nd CHECK BY





Exit

New headwall built in 1955 due to road widening. Top of headwall was scaling away and 1 section of reinforcing steel exposed.

Entrance

Headwall in fair condition. Left wingwall contained deep scale. Left wingwall in poor condition. Joint between left wingwall and headwall scaled up to 1' in depth.

From south to north (entrance to exit) - 1st joint (behind headwall) scaled 6"-1' in depth. 2nd joint was scaled 8" deep and had slow seepage. Next 2 joints have slow leakage, but no scaling. Some joints in cast iron pipe contained some seepage, but pipe was in good condition. 2nd joint in the concrete arch (north end) has some dripping. A crack exists in the center of the arch between joints. Drain in top of culvert on south side of road.

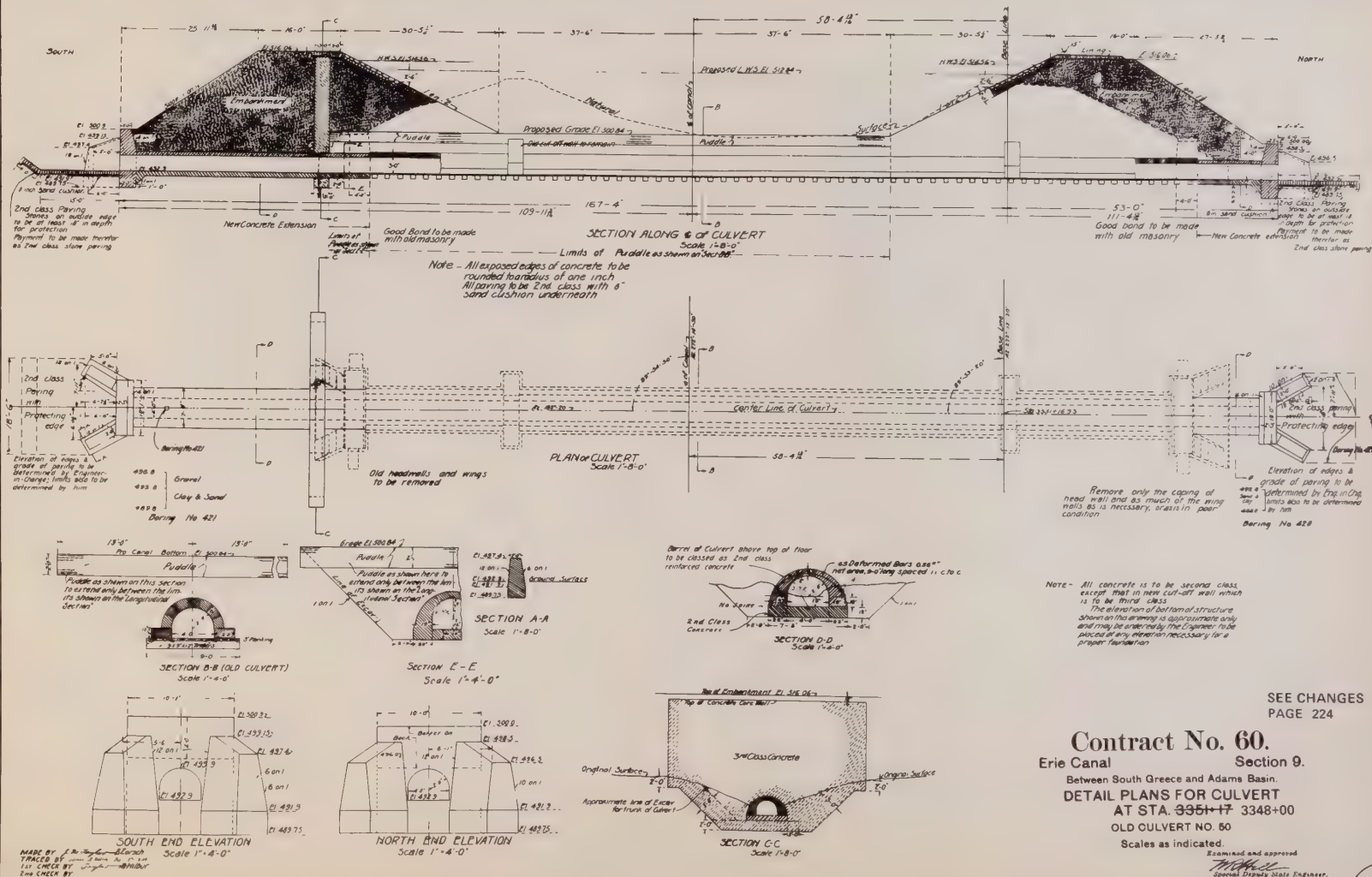


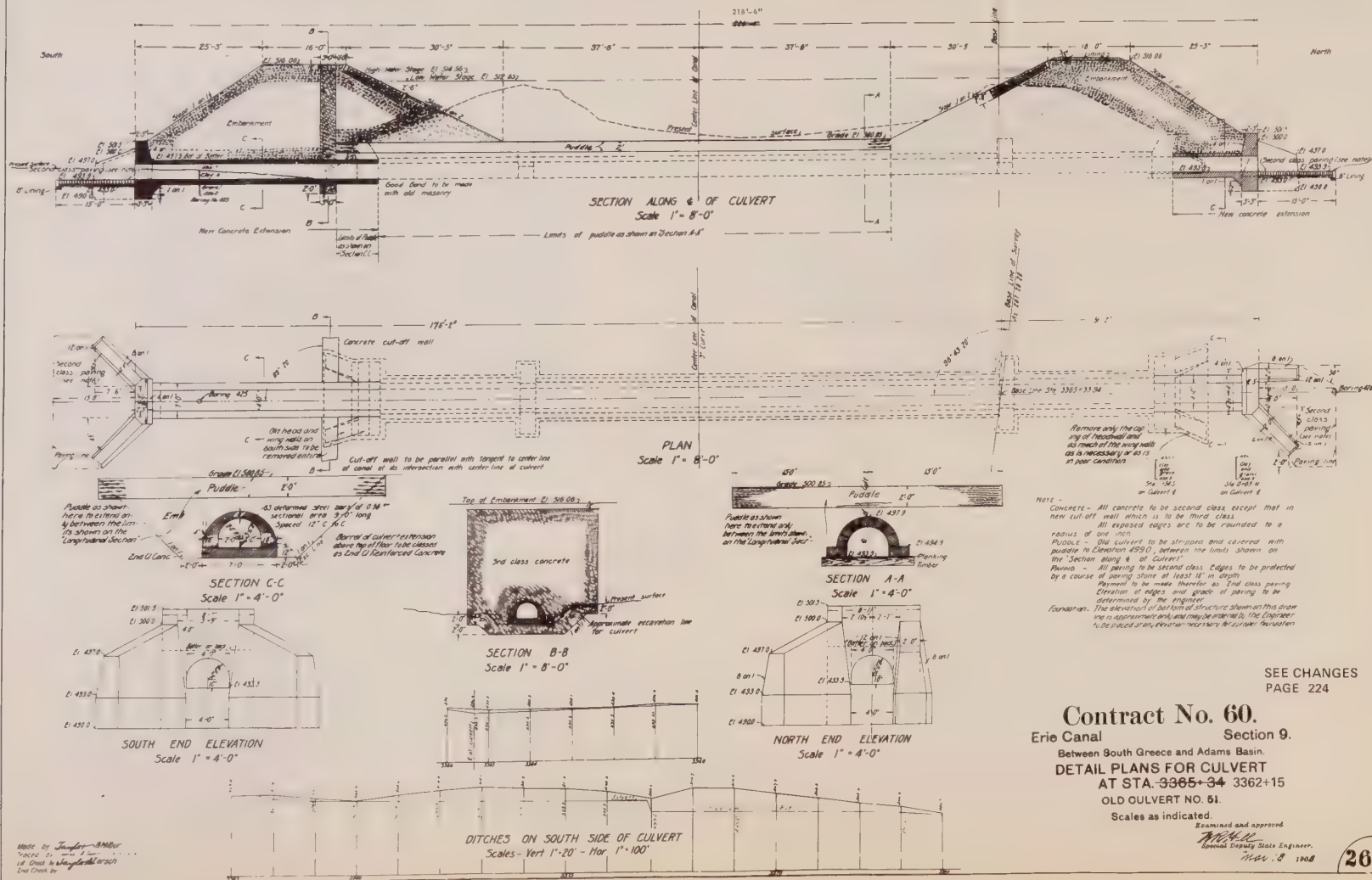
Exit

Headwall cracked 1' below top where concrete was covered with efflorescence. Wingwalls in good condition. Outlet area was all silted in. Little or no water flow.



Exposed sheet piling on south embankment. Wadewater area is at right. The south end of this culvert was plugged prior to creating the wadewater area. See Introduction Canal Culverts.





Not Inspected



Exit

Headwall and right wingwall in good condition. Left wingwall in poor condition. Horizontal cracks scaled $1\frac{1}{2}$ ' wide and up to 1' deep. Outlet ditch silted in.



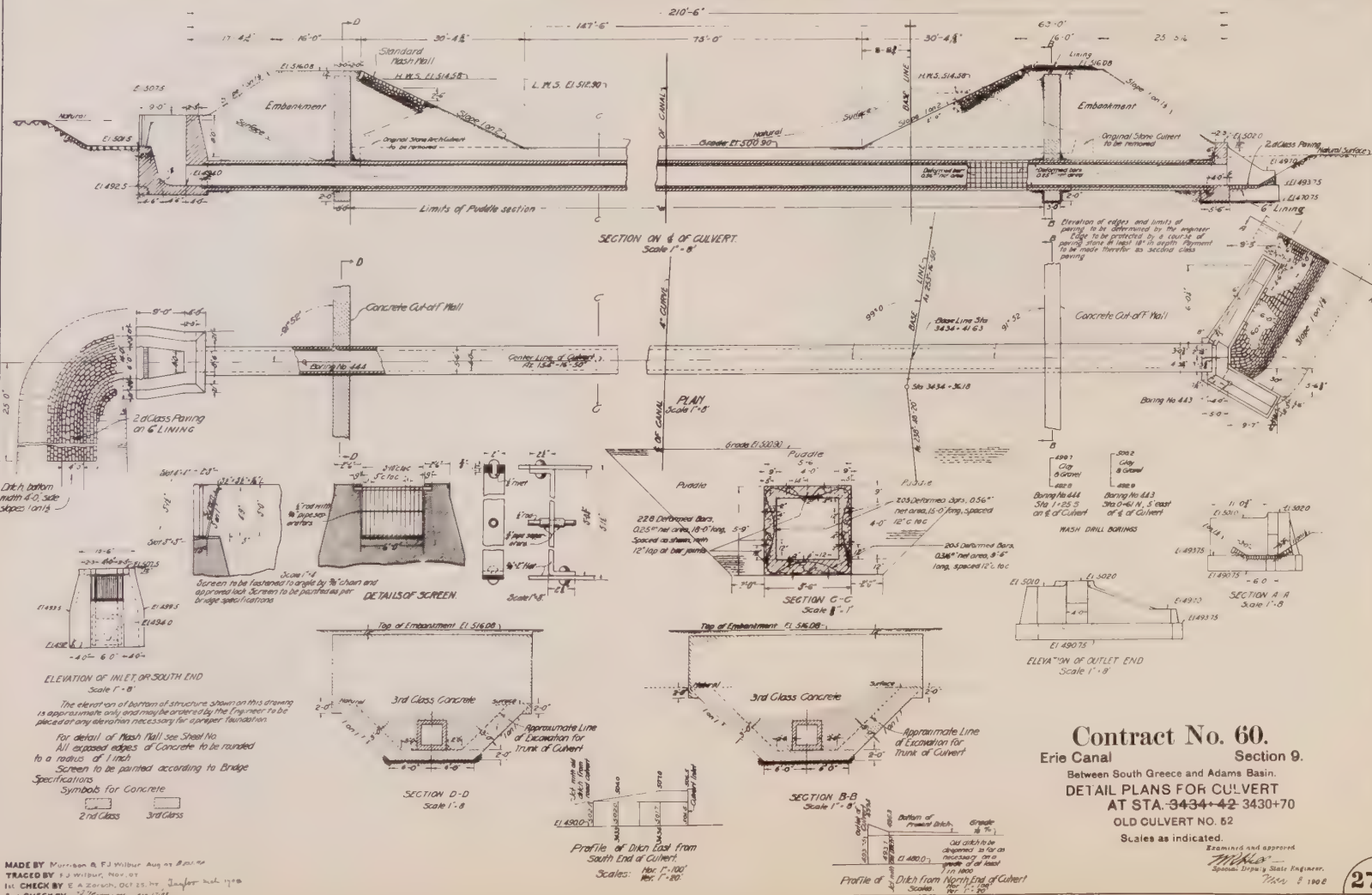
Exit

Headwall and wingwalls were in good condition. They appear to have been coated with mortar. Some surface cracking on the right wingwall.

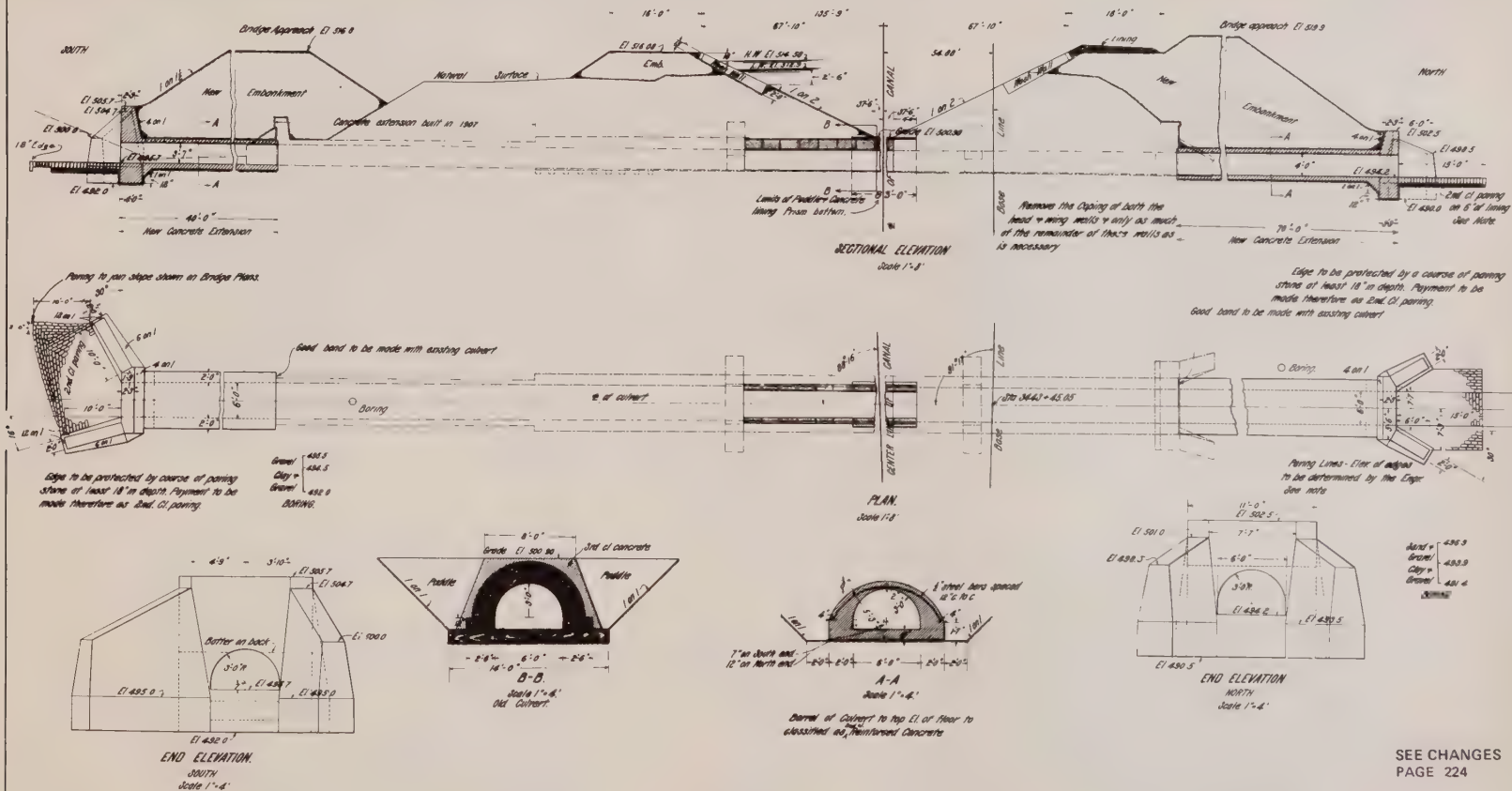
Entrance

Headwall and wingwalls in good condition.

From north to south (exit to entrance) - Some seepage through joints in 60' long concrete arch. Both cast iron pipes had some seepage through all joints. 1st joint south of cast iron pipe, hole in ceiling (plugged drain) had steady dripping. 2nd and 3rd joints from twin cast iron pipes had steady leaking. 30' from the south end, on the east side of the culvert, there was a 1 square foot hole (gravel and water washing in, roadway overhead). 20' from the south end, on the west side, there was a scaled hole 2' in diameter and 1' in depth. Starting 3' in from entrance headwall to approximately 12' in on the west side, scaling 1' deep and 1' wide. 3-4" of scaling at joint between headwall and concrete arch.



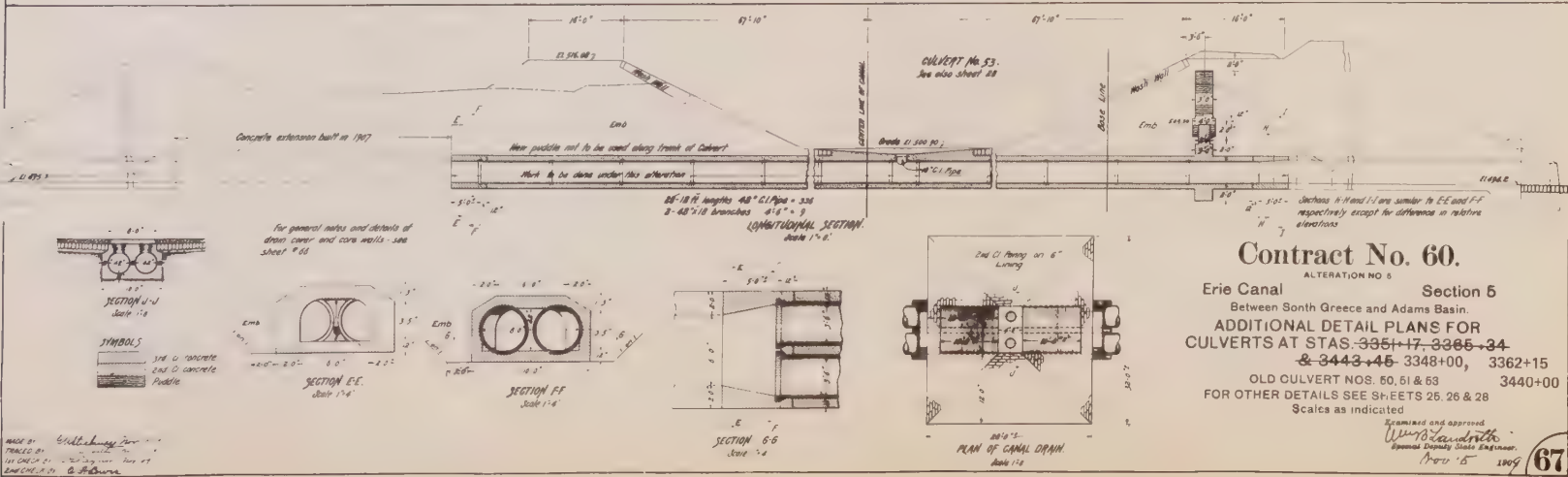
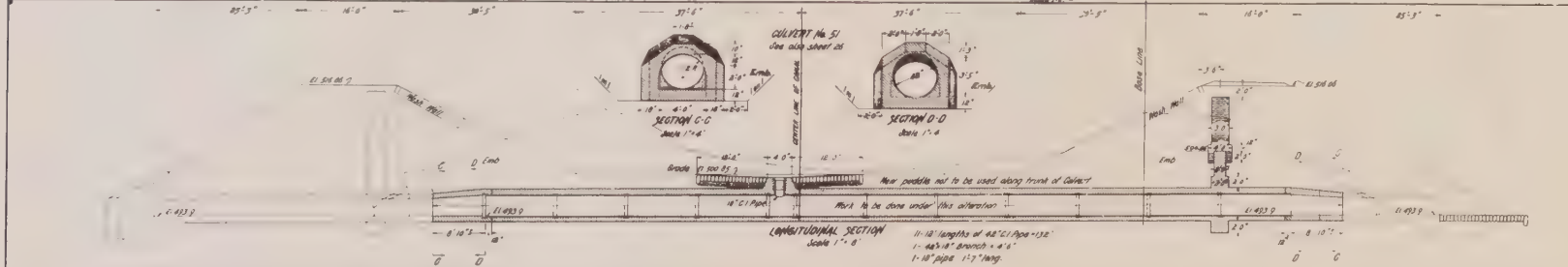
MADE BY Morrison & F.J. Wilbur Aug. at B.C. 1907
 TRACED BY F.J. Wilbur, Nov. 07
 1st CHECK BY E.A. Zerkow, Oct. 25, 1911
 2nd CHECK BY J. Morrison, Jan. 1911



Contract No. 60.
Erie Canal Section 9.
 Between South Greece and Adams Basin.
DETAIL PLANS FOR CULVERT
AT STA. 3443+45 3440+00
OLD CULVERT NO. 83
 Scales as indicated.

MADE BY: J. Taylor - B. Morris
 TRACED BY: J. H. Brown, 1/10/60
 1st CHECK BY: J. Taylor & Morris
 2nd CHECK BY:

Examined and approved
 J. H. Brown
 Special (Temporary) State Engineer.
 7/16/60 1/10/60



ALTERATION NO 8

Erie Canal Section 5

Between South Greece and Adams Basin.

ADDITIONAL DETAIL PLANS FOR

CULVERTS AT STAS. ~~335+17, 3385+34~~
~~3443+46~~ 3348+00, 3362+15
3440+00

OLD CULVERT NOS. 50, 61 & 63

FOR OTHER DETAILS SEE SHEETS 26.26 & 28

Scales as indicated

Examined and approved
Wm B Landroth
 Special Deputy State Engineer.
 Nov 5 1909



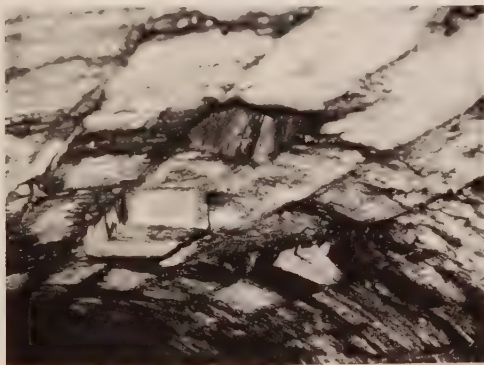
Entrance

Headwall and wingwall areas contained a number of small cracks, but concrete generally in fair to good condition.



Exit

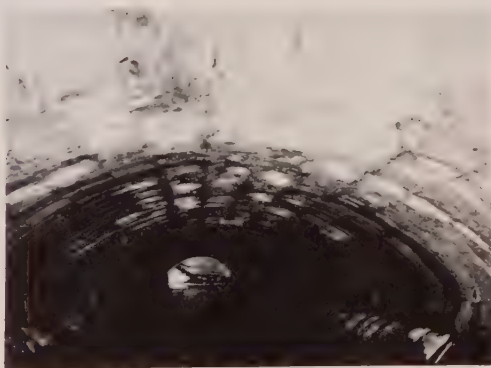
Headwall and wingwall areas contained a number of small cracks, but concrete generally in fair to good condition.



West Barrel - Partially Missing and Slipped Blocks, Looking South



West Barrel - Partially Missing and Slipped Blocks, Looking North



East Barrel - Looking South

Continuous dripping throughout. Heaviest leakage area was near the center around a cracked stone block (series of drip size streams). Concrete arches generally in good condition.



West Barrel - Looking South

Continuous dripping throughout. South end (80') was concrete (40' concrete arch and 40' of stone block arch lining). Arch lining contained numerous efflorescent covered cracks. One stone block near the center has slipped down 5". Also 6 partially broken stone blocks near center and 3 of these have holes up to 1½' deep. Stone block joints adjacent to north head-wall open 1" wide and 1' deep or more. Concrete arches generally in good condition.

Both barrels need repair.



Culvert #55 (Dive)

197' of 8' Wide X 5' High Concrete Arch
Not Inspected



Exit

Headwall in good condition. Ends of both wingwalls fractured and starting to fall apart. Right wingwall has broken loose from headwall. Two steel beam braces prevent right wingwall from moving inward. 5 syphons.

Culvert #55½ (Dive)

235' of 2' Wide X 1.5' High Concrete Box
Not Inspected



Exit

Headwall and wingwalls in good condition.
4-3" syphons, 2 were active.

Culvert #56 (Dive)

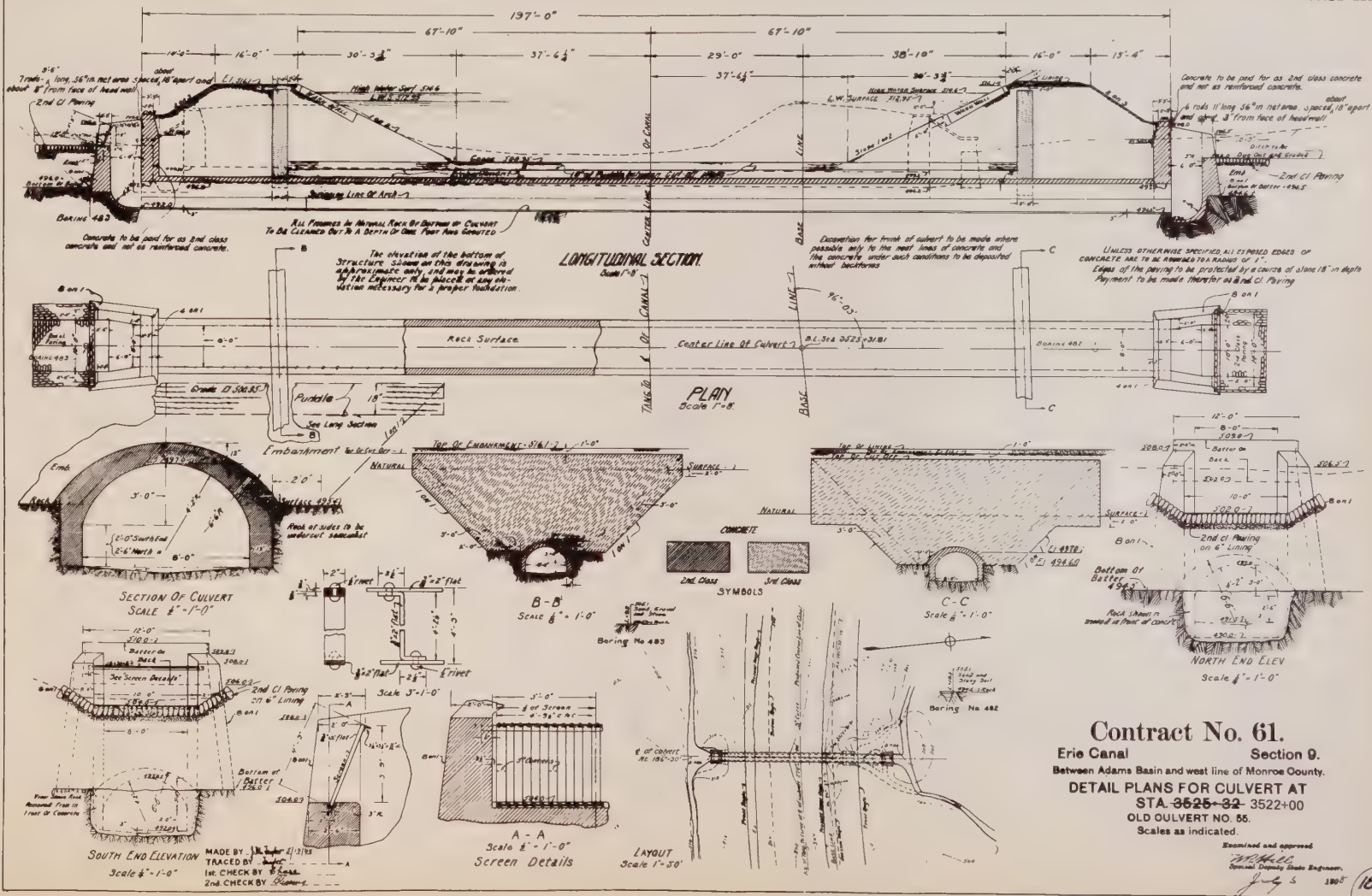
PAGE 228

130' of Twin 48" Cast Iron Pipe
90' of 7.5' Wide X 5' High Concrete Arch
11' of 12' Wide X 8' High Concrete Slab
Not Inspected



Exit

Headwall and wingwalls in good condition.
10" and 4" syphon.





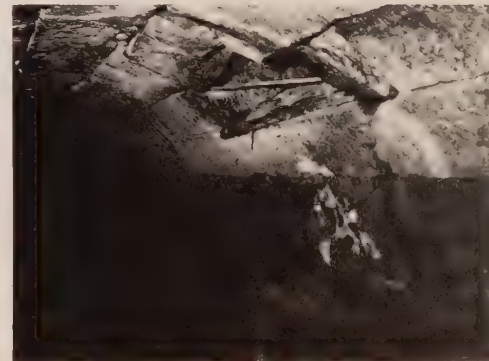
Entrance

Concrete in good condition except that right wingwall and corner of headwall has sheared and moved approximately 4" inward. Also, left wingwall has sheared from headwall. Deep scrape mark on right wingwall.

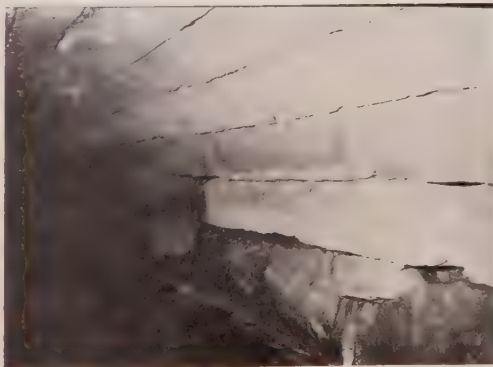


Exit

Headwall and wingwalls in fair to good condition with only a few small cracks.

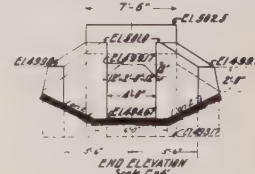
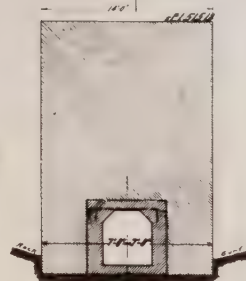
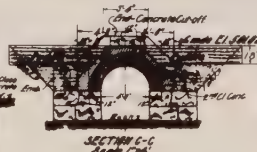
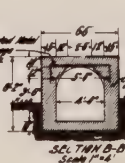
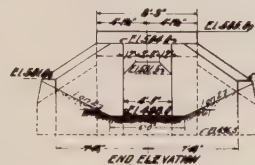
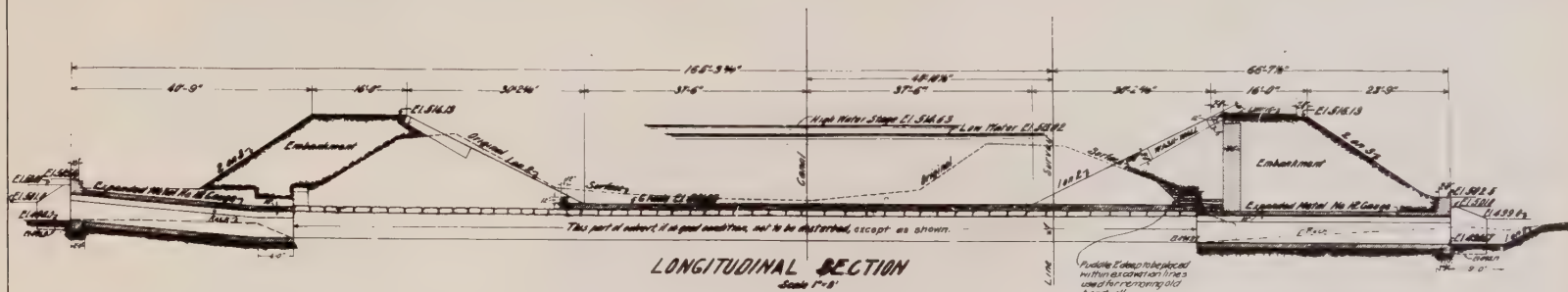


East Wall - partially missing block in ceiling, stick and board wedged in 1' deep hole.



East Wall - Looking North, note open joints

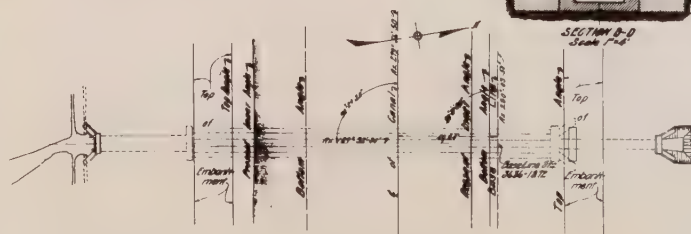
From north to south (exit to entrance) - between 10 and 20' into the concrete arch, there was a longitudinal overhead crack with some seepage. Stone block arch begins after 50'. About 100' in, a 1' x 2' stone block near base of stone block arch wall was missing (heavy water flow could be heard in rocks behind missing block). About 3' south of 2 plugged drains, a steady flow of water was coming through joints on east wall at the spring line. No mortar between the stone blocks. 75' from south end, 1 stone block on east and west wall are partially missing, but there was no leakage. Last 40' of concrete arch at south end was in good condition. 25' in from south end was a 12" diameter syphon in the ceiling. Repairs are needed.



NOTES

The elevations of the bottoms of structures shown on this drawing are approximate only and may be ordered by the Engineer to be placed at any elevations necessary for proper

Corrosion extends, at once and, to greatest depth with
present water, is greater, is deeper and is more
extensive in such to be made only to the outer limits of concrete
and concrete under such conditions to be deposited without backforms
Excavation for the trunk of concrete to be made where possible only to
the outer limits of concrete and the concrete under such conditions
to be deposited without backforms



SEE CHANGES
PAGE 243

Contract No. 61.

Erie Canal **Section 9.**
Between Adams Basin and west line of Monroe County.

DETAIL PLANS OF CULVERT AT

STA. ~~3636+19~~ 3632+87

OLD CULVERT NO 57

Scales as indicated

Examined and approved
Wm. Hill
 Special Deputy State Engineer.

MADE BY T. HALL, 6-08
 TRACED BY BRYAN 6-08
 1st CHECK BY J. A. F. 6-08
 2nd CHECK BY J. A. F. 6-08

(21)

Culvert #58 (Dive)

144.5' of 48" Cast Iron Pipe
78.5' of 3.5' Wide x 4.5' High
Concrete Arch

Not Inspected



Exit

Headwall and wingwalls in good condition.
Culvert well filled with debris.

Culvert #58½ 145' of 16" Cast Iron Pipe



Entrance

The grate is apparently the entrance to this culvert which drains low areas behind the south canal wall.

A manhole buried under the towpath on the north side leads to the exit end.

Culvert #59

PAGE 234

180' of Twin 42" Cast Iron Pipe
22' of 8' Wide x 4' High Concrete Box
100' Long Entrance on North End.
Extends ¼ Mile on South End to
Brockport State College.

Culvert #59½

165' of ½-48" Concrete Pipe
(18" concrete encased sewer in bottom
half of pipe)
35' of 36" Cast Iron Pipe
(Connects to north end of Culvert 59)



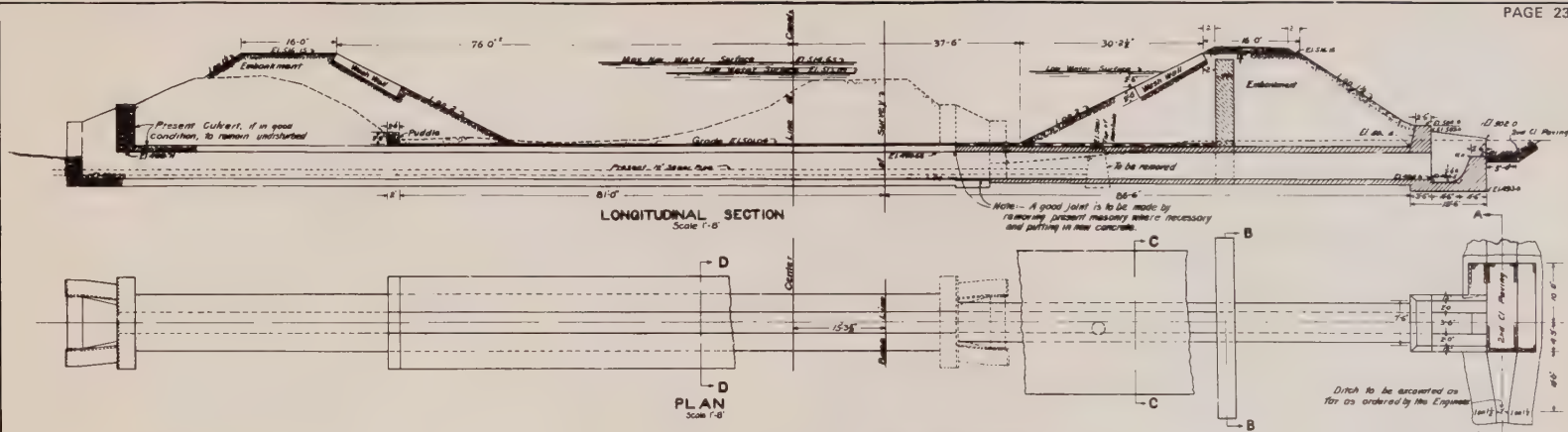
New Common Exit for Culverts #59 and 59½

Culvert #59

Good condition, some joint seepage.

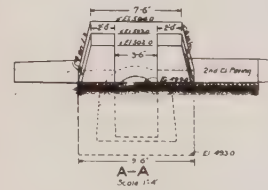
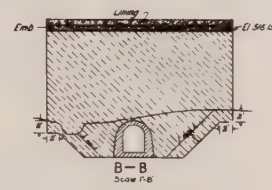
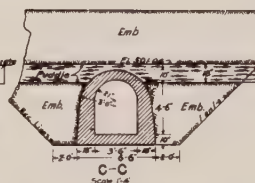
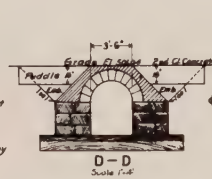
Culvert #59½

Most joints had seepage and some were covered with soda straws. Half the concrete pipe sections had cracked 1' south of the joints as denoted by efflorescence and soda straws. Some cracks went all the way around the semi-circular arch and the others 1/3 to 1/2 the way around. 36" connection in good condition. Installed by Village of Brockport Permit #66-1-9



NOTE:
Large material in joints to be removed and masonry or concrete to be changed to separate concrete as indicated and to be as shown.

Section D-D is made up from two drawings and may not be the actual section of present culvert. If culvert is found to be as in drawing it is to be strengthened by 2nd class concrete as shown. If section is found to be different it is to be strengthened if necessary in some similar way as ordered by the Engineer.



2nd Class Concrete
3rd Class Concrete



NOTE:
All proposed changes of concrete to be removed to 1/2 inch except as otherwise noted.
The alterations of the bottom of structures shown in this drawing are approximate only and may be ordered by the Engineer to be placed or any alteration necessary for a proper foundation.
Copes of piers to be protected by a course of stone 18" in depth. Payment made there for as per C.P. 1111.
Excavation for front of culvert to be made where possible only in the most lines of the concrete and concrete under such conditions to be deposited without backfills.

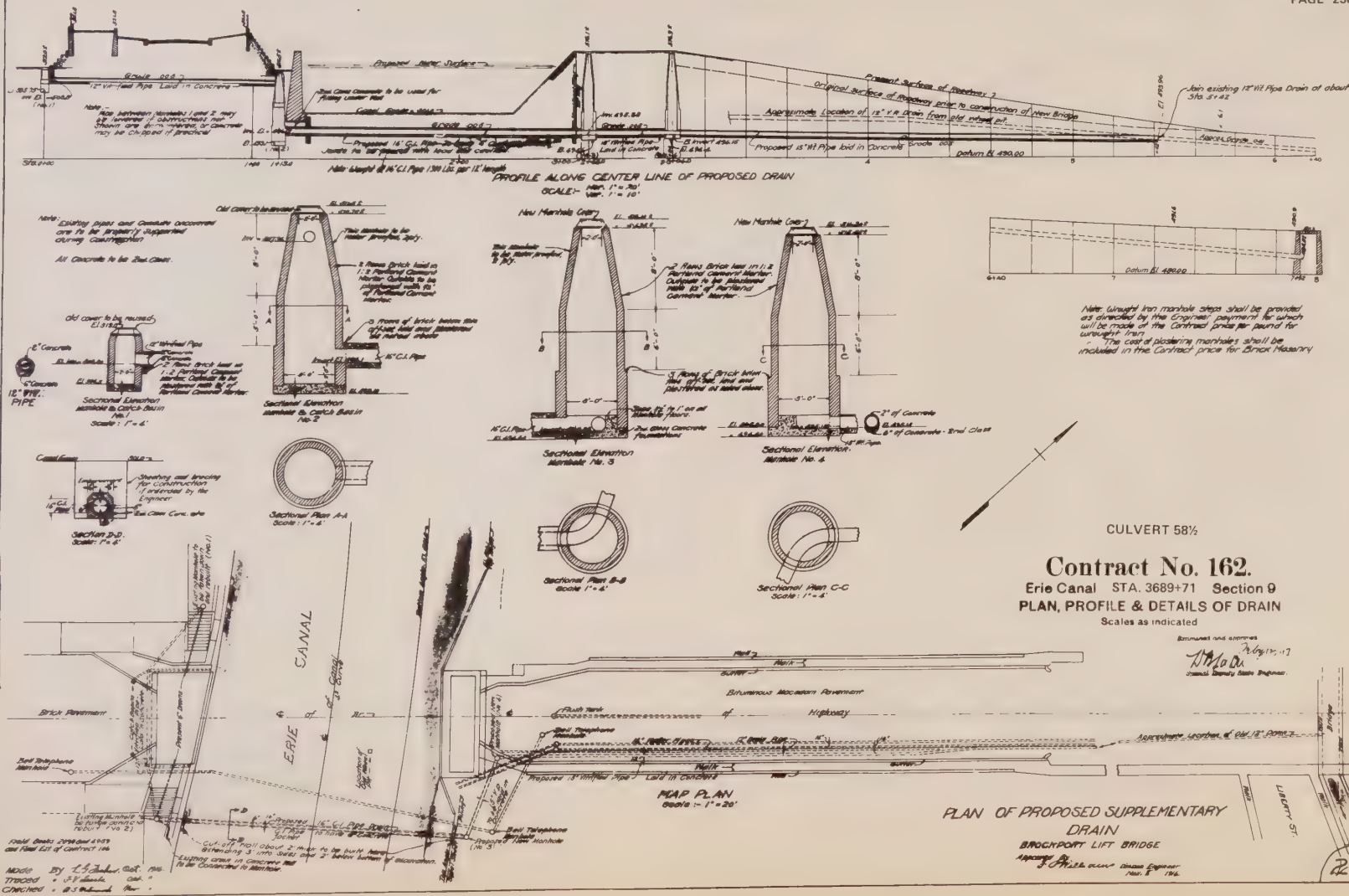
SEE CHANGES
PAGE 243

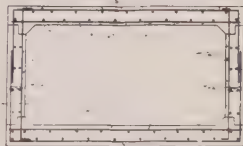
Contract No. 61.

Erie Canal Section 9.
Between Adams Basin and west line of Monroe County.

DETAIL PLANS OF CULVERT AT
STA. 3675+20 3671+84
OLD CULVERT NO. 68
Scales as indicated

Examined and approved
M. J. McPherson
Special District Engineer.





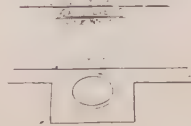
TRANSITION SECTION



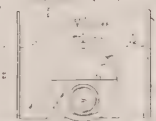
SECTION ON BOX CULVERT



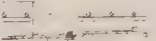
SECTION ON BOX CULVERT



SECTION ON BOX CULVERT



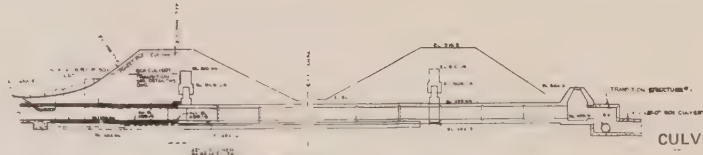
SECTION ON BOX CULVERT



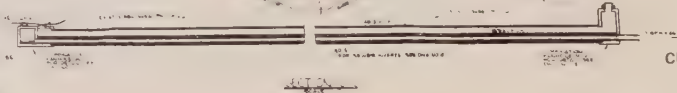
SECTION ON BOX CULVERT



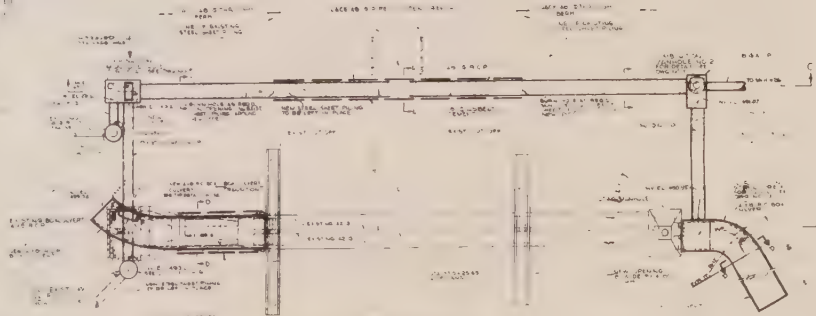
SECTION ON BOX CULVERT



CULVERT NO. 59

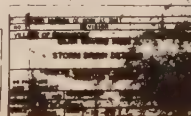


CULVERT NO. 59%



SECTION ON BOX CULVERT TRANSITION DETAIL

CULVERT NO. 59 & 59%
STA. 3710+26
STA. 3710+68





Entrance

Headwall was in fair condition. Cracked, but intact. Wingwalls were in good condition. Trash rack had fallen over.



Exit

Headwall had one vertical crack in the center. Numerous transverse cracks with efflorescence. Structure in fair condition.

From north to south (exit to entrance) - The 2nd joint in the cast iron pipe has a 5" gap. (Pipe was not pushed into 5" long bell housing.) Concrete can be seen surrounding pipe. Joint has some seepage. 75' into pipe and 1' south of joint, a 6" square hole at the top of the pipe had a steel plate patch over it. This area leaked 6 steady drip streams of water. Some seepage through joints, but most were dry. Possible minor repairs needed at patch.

Culvert #61 (Dive) 204.5' of 5.5' Wide x 4'3" High
Concrete Arch
Not Inspected



Entrance

Some cracks on headwall and wingwalls, but generally in fair to good condition. 6 syphons, 1 active.



Exit

A few small cracks, but headwall and wingwalls generally in good condition.

Culvert #62 (Dive) 203' of 4' x 4' Concrete Arch
Not Inspected

PAGE 241



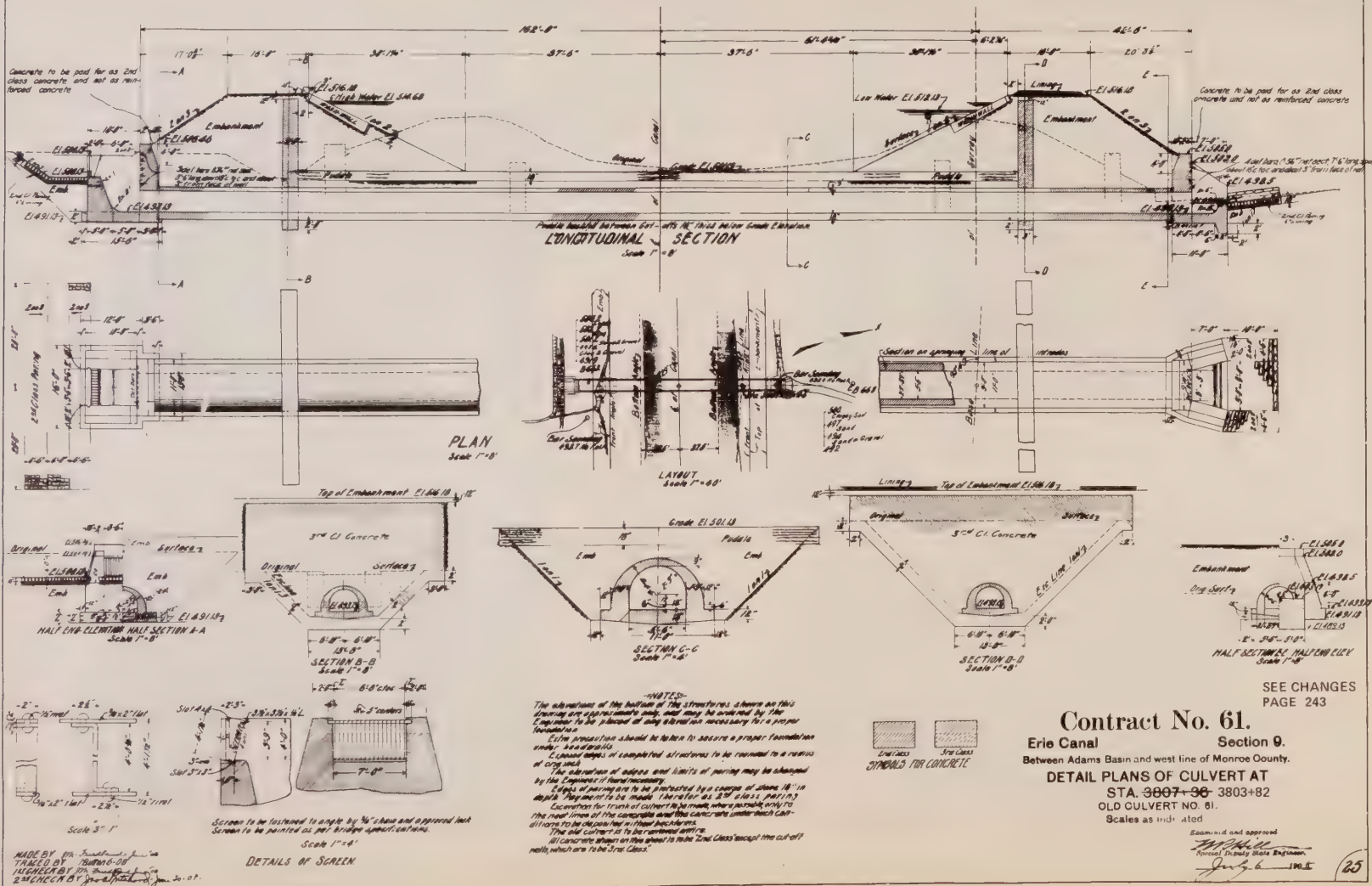
Entrance

Headwall in good condition. Cracks and scaling on wingwalls, fair condition. Note attempts to fence off culvert well.



Exit

Headwall and wingwalls in fair condition, 1-2" deep scaling. 2 syphons, 10" syphon active.

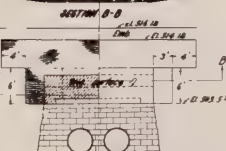


GENERAL NOTES

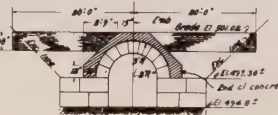
The elevations of the bottoms of the structures shown on these plans are approximate only and may be ordered by the Engineer to be placed at any elevation of foundation necessary for a proper foundation.
Extra precaution should be taken to secure a proper foundation under head walls.
Exposed angles of masonry structures are to be rounded to a radius of one inch.
Edges of paving are to be protected by a course of stone 18" in depth. Payment therefor to be made as and class paving.
Location for front of culvert and manholes to be made where possible only to meet lines of the concrete and the concrete under such conditions to be discarded without foundation.
If proper connection to be made between old and new masonry in at which alignment and head.
Profile of ends of concrete to be used only when found necessary by the Engineer.
Length of concrete to be determined by the Engineer.

SYMBOLS

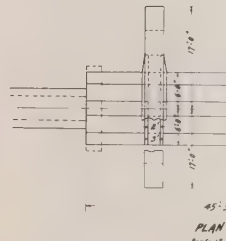
Profile
and class concrete
and class concrete



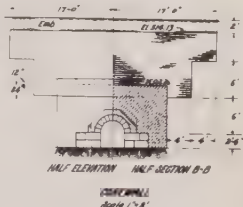
HALF SECTION HALF ELEVATION
A-A Scale 1"=6'



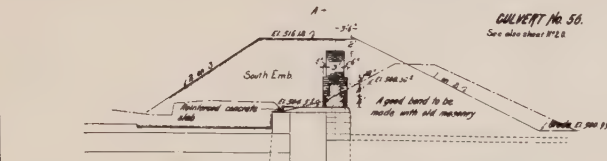
SECTION G-G
Scale 1"=6'



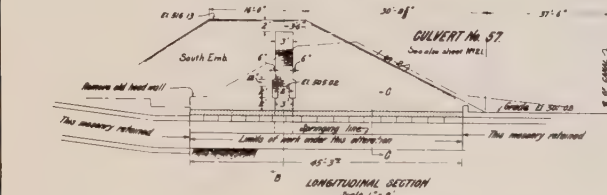
PLAN
Scale 1"=6'



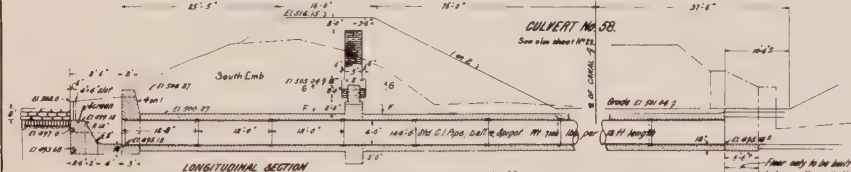
HALF SECTION HALF ELEVATION
B-B Scale 1"=6'



LONGITUDINAL SECTION
Scale 1"=8'



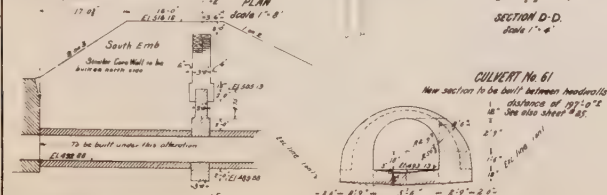
LONGITUDINAL SECTION
Scale 1"=8'



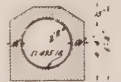
LONGITUDINAL SECTION
Scale 1"=8'



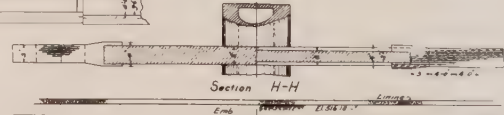
PLAN
Scale 1"=8'



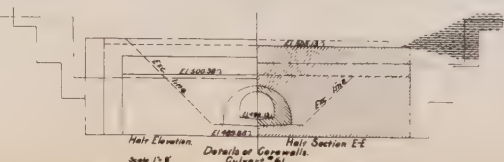
LONGITUDINAL SECTION
Scale 1"=8'



SECTION D-D
Scale 1"=6'

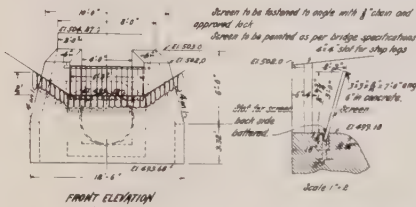


SECTION H-H
Scale 1"=6'

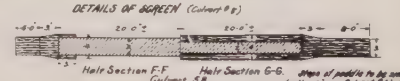


HALF ELEVATION
Scale 1"=6'

DETAILS OF CULVERT
Culvert No. 61



FRONT ELEVATION
Scale 1"=6'



DETAILS OF CULVERT
Culvert No. 61

Contract No. 61.

ALTERATION NO. 3

Erie Canal Section 9

Between Adams Basin and west line of Monroe County

ADDITIONAL DETAIL PLANS FOR CULVERTS

AT STAS. 3595+72.3030+10.3075+26.4

3807+36 3592+33 3632+87

OLD CULVERT NOS. 66, 67, 68 & 61 3671+84

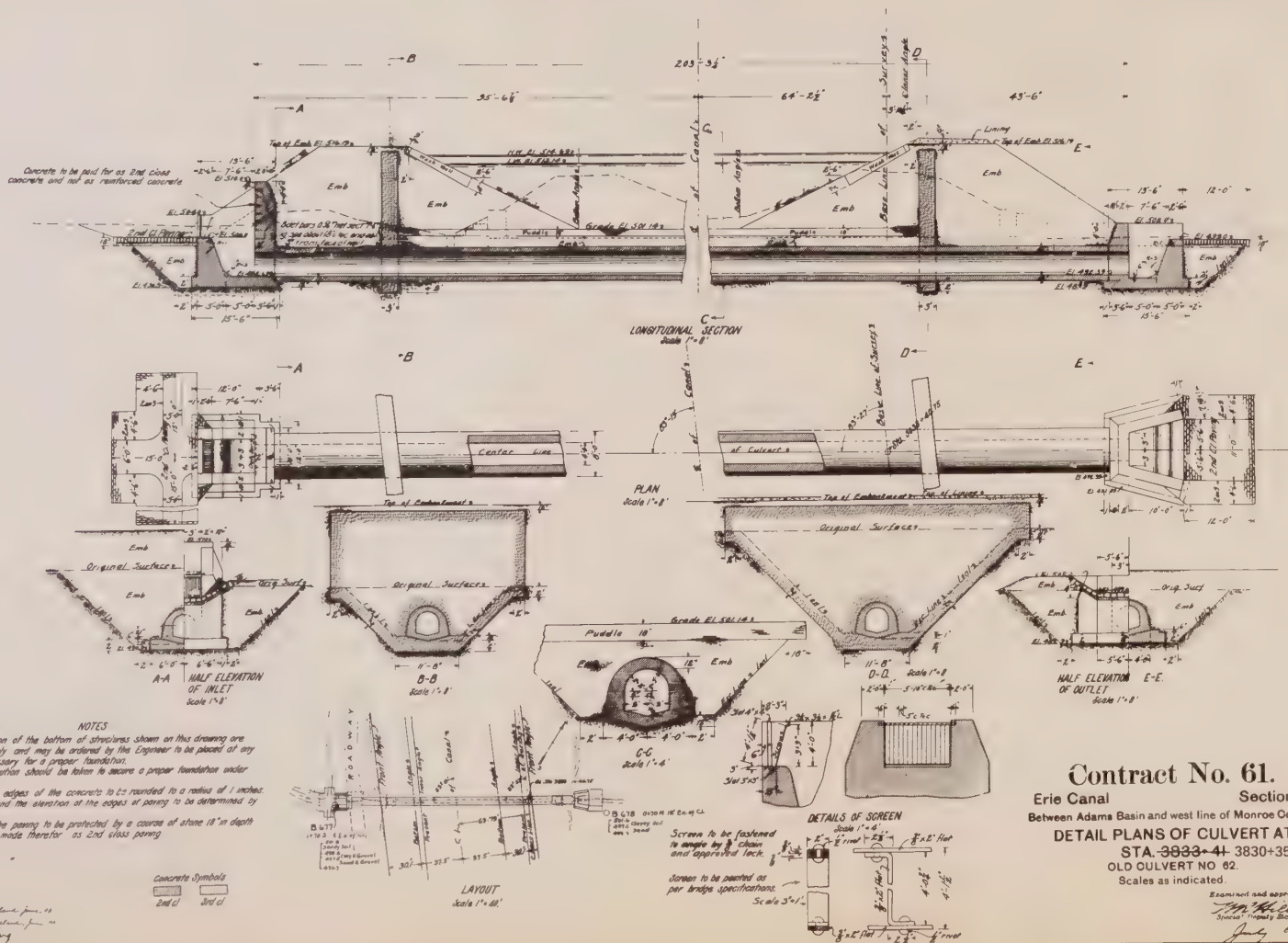
Scales as indicated 3803+82

Examined and approved

Special Deputy State Engineer

DATE 1909

MADE BY J. C. Casper 2-26-09
TRACES BY J. C. Casper 2-26-09
15% CHECK BY J. C. Casper 2-26-09
25% CHECK BY J. C. Casper 2-26-09





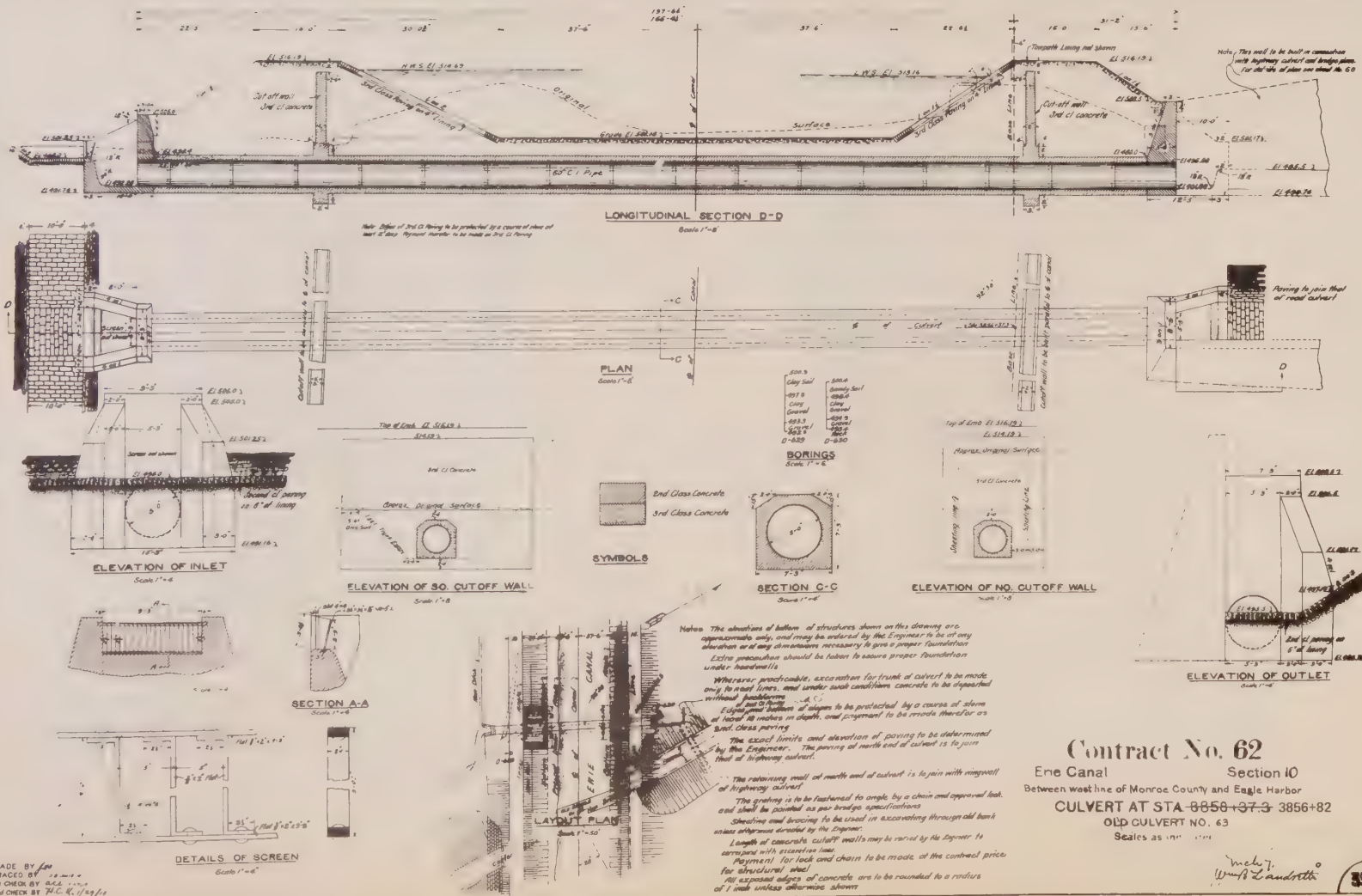
Exit

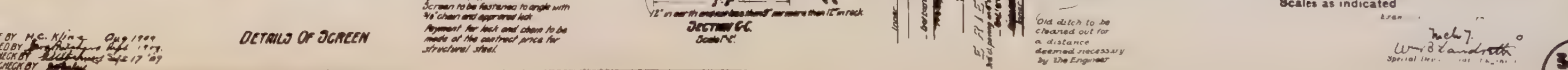
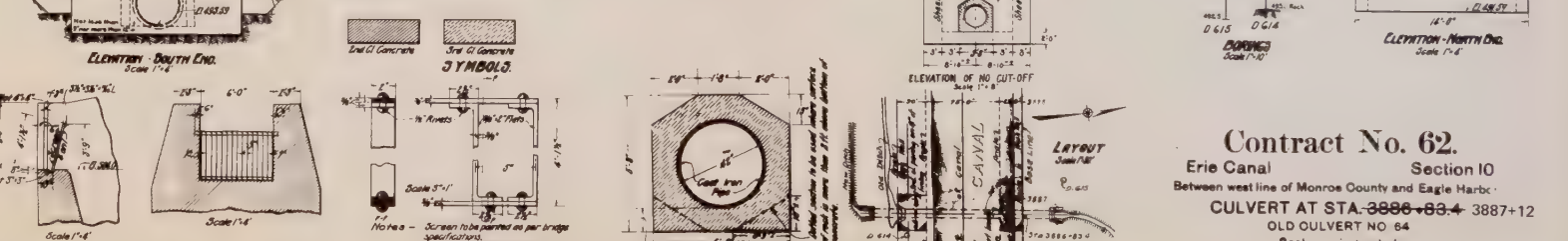
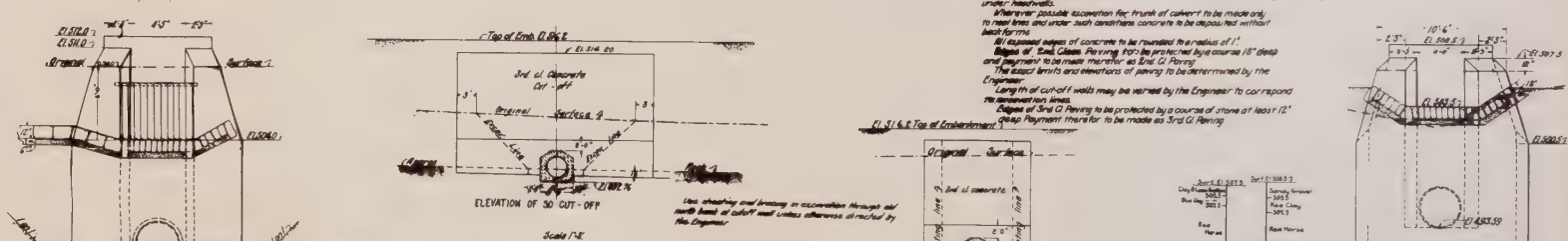
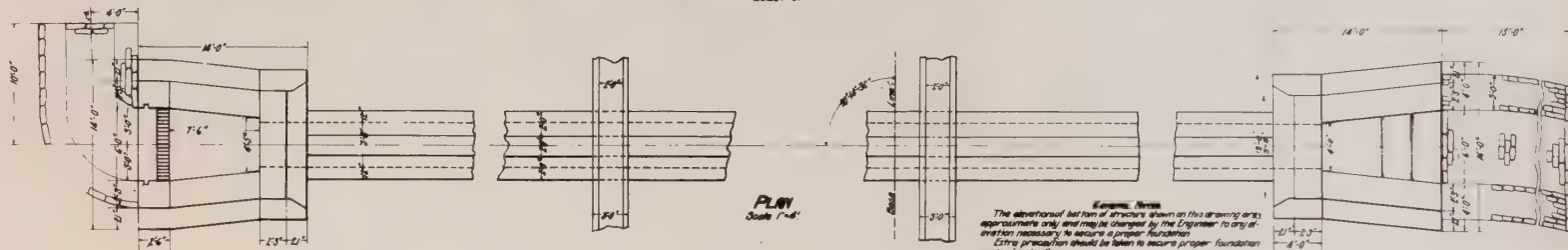
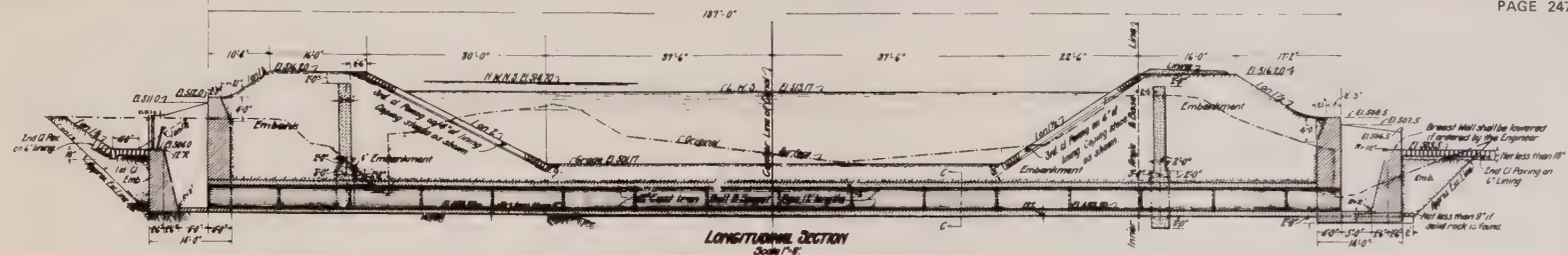
Top 6' of headwall in good condition.
Bottom 10' of headwall in fair to poor condition.
1 syphon. Roots growing out 8" deep scaled area 10'
from top of headwall. Right wingwall was delaminated
and in fair condition. Left wingwall is actually a
large retaining wall (40' long, 20' high) for an aban-
doned road over the canal. Old road had twin 4' x 4'
stone block arch culverts. North culvert has collapsed.
South culvert has a 42" corrugated metal pipe inside.
Gap between stone blocks and metal pipe grouted.



Exit

Headwall and wingwalls in poor condition. 4" deep
scaling on headwall and much deeper on wingwalls.

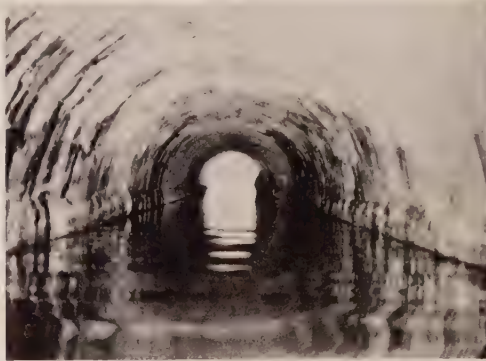






Entrance

Headwall and wingwall areas in fair to good condition with cracks, cold joints and scaling. Left wingwall was partially undermined. South end concrete arch constructed when embankment was widened for railway. See Holley Trough Introduction and Plans.



Looking South Toward Entrance

Heavy buildup (2" or more) of mineral deposits on the stone block arch walls from slow seepage. A concrete encased sewer pipe runs along the west side of the barrel. One can walk along the top for about 100' from the south end before the water gets too deep for hip boots.



Exit

Headwall and wingwalls in fair condition due to numerous cracks. Water in culvert about 4' deep.



Method of Inspecting Culverts #65 and 86

From south to north (entrance to exit) - south entrance for 50' was concrete arch. The arch was in good condition except for scaling along the bottom portion. The stone block arch had a large number of short soda straws and heavy efflorescence with constant dripping for the first 15'. The arch was dry for the next 40-50', after which dripping continued the length of the barrel to the north concrete arch (a few steady drips, but nearly all were slow, 1 drip every few seconds). Efflorescence from 1-3" thick, in streaks, covered both walls and indicated active seepage. North concrete arch had approximately 6 areas of spalled concrete 2" in depth. Expanded metal lath, used in the construction of the north arch, was approximately 5% exposed due to spalling of concrete. North concrete arch was dry, except for slow seepage at a few joints. Except for a few voids between some stone blocks, the blocks in the barrel were in good condition. None seemed to be missing, slipped or cracked, but it was difficult to see under the thick coating of mineral deposits. Although the culvert appeared to be fair to good condition, no inspection could be made below the water line.



Exit

Top half of headwall and top of wingwalls in good condition. Bottom section of headwall area and wingwalls in fair to poor condition with deep scaling, cracks and delaminations. Water in culvert could be lowered 1-2' by cleaning out ditch.



Entrance

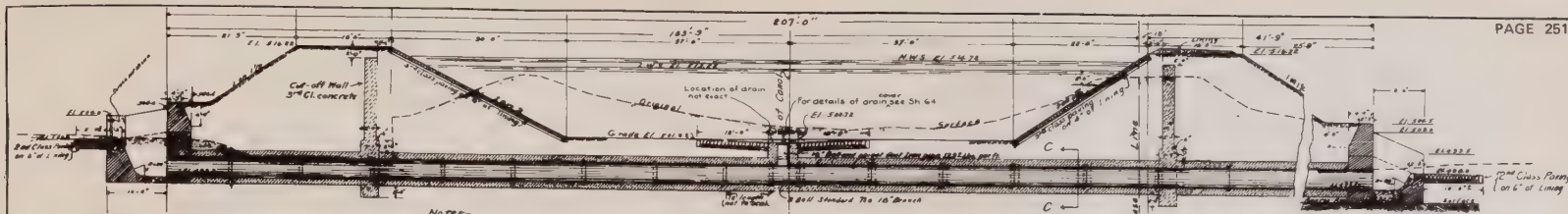
Headwall had a vertical crack over the center of the pipe. Generally headwall was in good condition. Wingwalls were in fair to good condition with some transverse cracks and efflorescence in the middle.



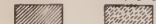
Exit

There was one vertical crack in the headwall. Otherwise, headwall and wingwalls were in good condition.

Cast iron pipe in good condition. Some drippage at 24" center drain. Slight zig zag in pipe noticed from the ends, but it cannot be detected inside.



SYMBOLS FOR CONCRETE



NOTE:-
Extra precaution should be taken to secure proper foundations under headwalls.
All exposed edges of Concrete to be rounded to a radius of 1/4 inch unless otherwise stated.

LONGITUDINAL SECTION

Scale 1/4\"/>

Notes:-
The Elevation of Bottom of Structures Shown on this drawing are approximate and may be changed by the Engineer. No any location necessary to secure a proper foundation.

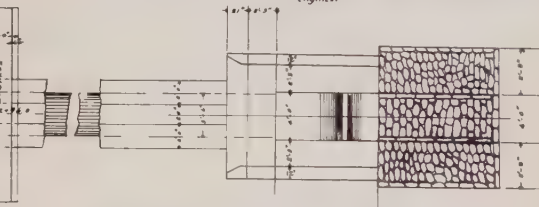
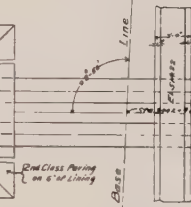
Whenever practicable, excavation for work of culvert to be made only in road area and under such conditions concrete to be deposited without head-frames. Shoring and bracing to be used in excavating through all north bank unless otherwise directed by the engineer.

Edges and bottoms of shapes of 2nd class paving to be protected by a coat of 'Stonair' least 1/8 inches in depth. Payment to be made there for as 2nd Class Paving.
The End Limits and Elements as paving to be determined by the Engineer.

For details of Drain Cover see Sheet No. 6-4.

PLAN

Scale 1/4\"/>



Notes on Screen:-
See details below. Screen to be painted as per bridge specifications.
Screens to be fastened to angle by 1/2\"/>

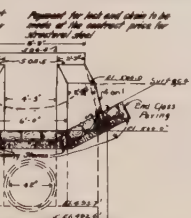
Top Embankment 11.5000

Edges of 3rd class paving are to be protected by a coat of 'Stonair' least 1/8\"/>

ELEVATION OF INLET SHOWING SCREEN

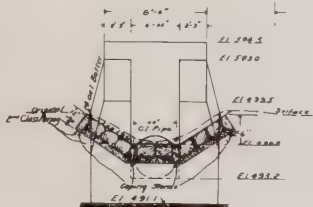
Section on Center Line of Culvert showing Screen and Slope for 3rd Class Paving.

Scale 1/4\"/>



HALF ELEVATION SOUTH GUPTOP

Scale 1/4\"/>



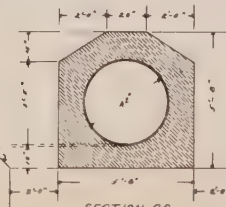
ELEVATION OF NORTH END

Scale 1/4\"/>

D-593 BORINGS D-594
Scale 1/4\"/>

ELEVATION OF SOUTH END

Scale 1/4\"/>



SECTION CC

Scale 1/4\"/>



LAYOUT PLAN

Scale 1/4\"/>

Contract No. 62.

Erie Canal Section 10

Between west line of Monroe County and Eagle Harbor

CULVERT AT STA. 3942+00 3943+93

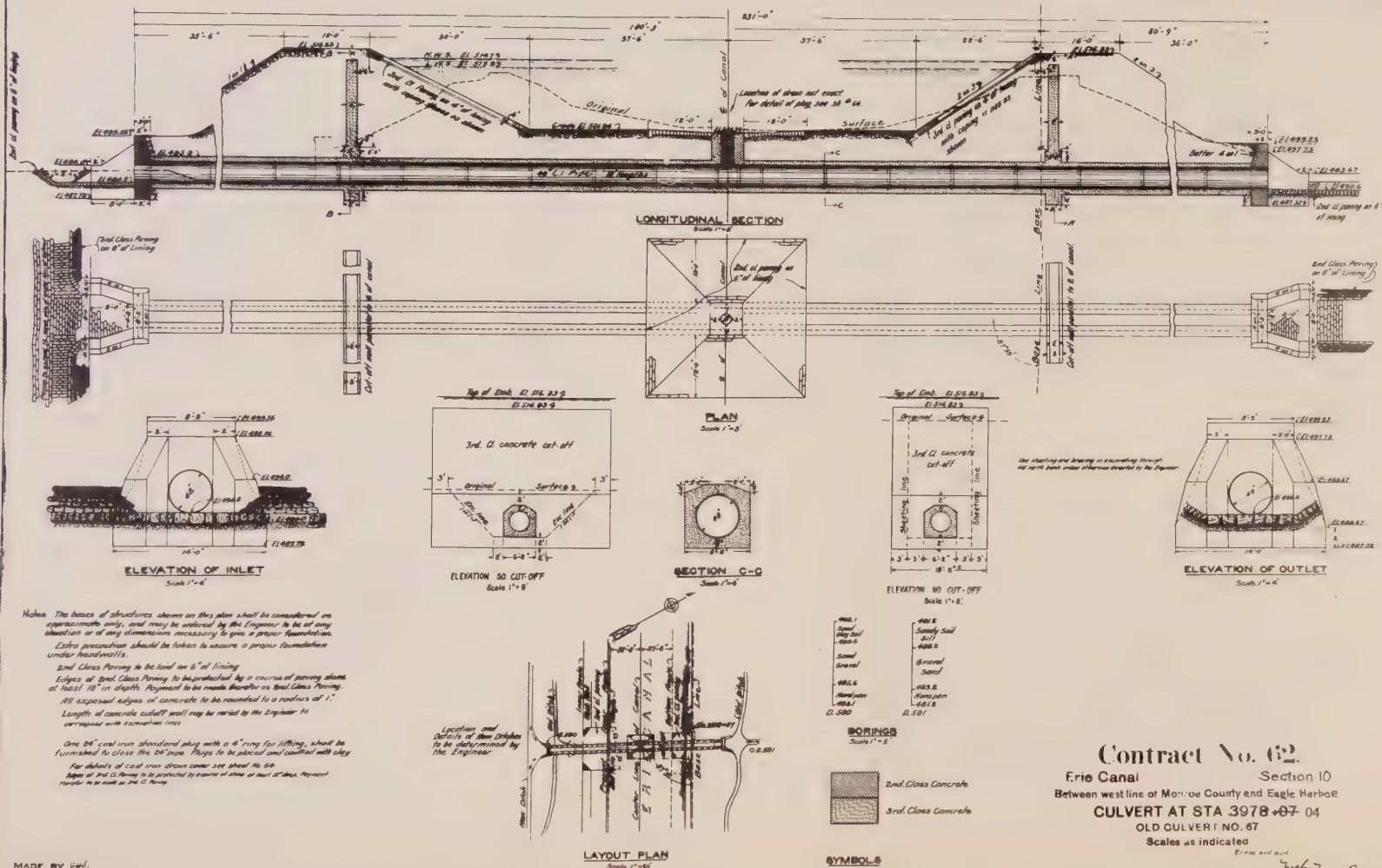
OLD CULVERT NO. 66

Scale as indicated

Examined and approved

Wm. B. Landolt
Approved by State Engineer

MADE BY
TRACES BY
1st CHECK BY
2nd CHECK BY



Contract No. 62.

Erie Canal Section 10
Between west line of Monroe County and Eagle Harbor

CULVERT AT STA 3978+07.04

OLD CULVERT NO. 67

Scales as indicated

From and to

Wm. J. Zarath



Exposed sheetpiling on south embankment. Widewater area is at left. The south end of this culvert was plugged prior to creating the widewater area. See Introduction, Canal Culverts.



Exit

Headwall and wingwalls in good condition

No active leakage, but 2 joints in north half had 1' long stalagmites. No leakage at 18" drain at center. South half of pipe partially filled with silt, gravel.

South end of pipe ended at round wooden plug. Entrance area filled with concrete prior to flooding widewaters. Cast iron pipe in good condition.



Entrance

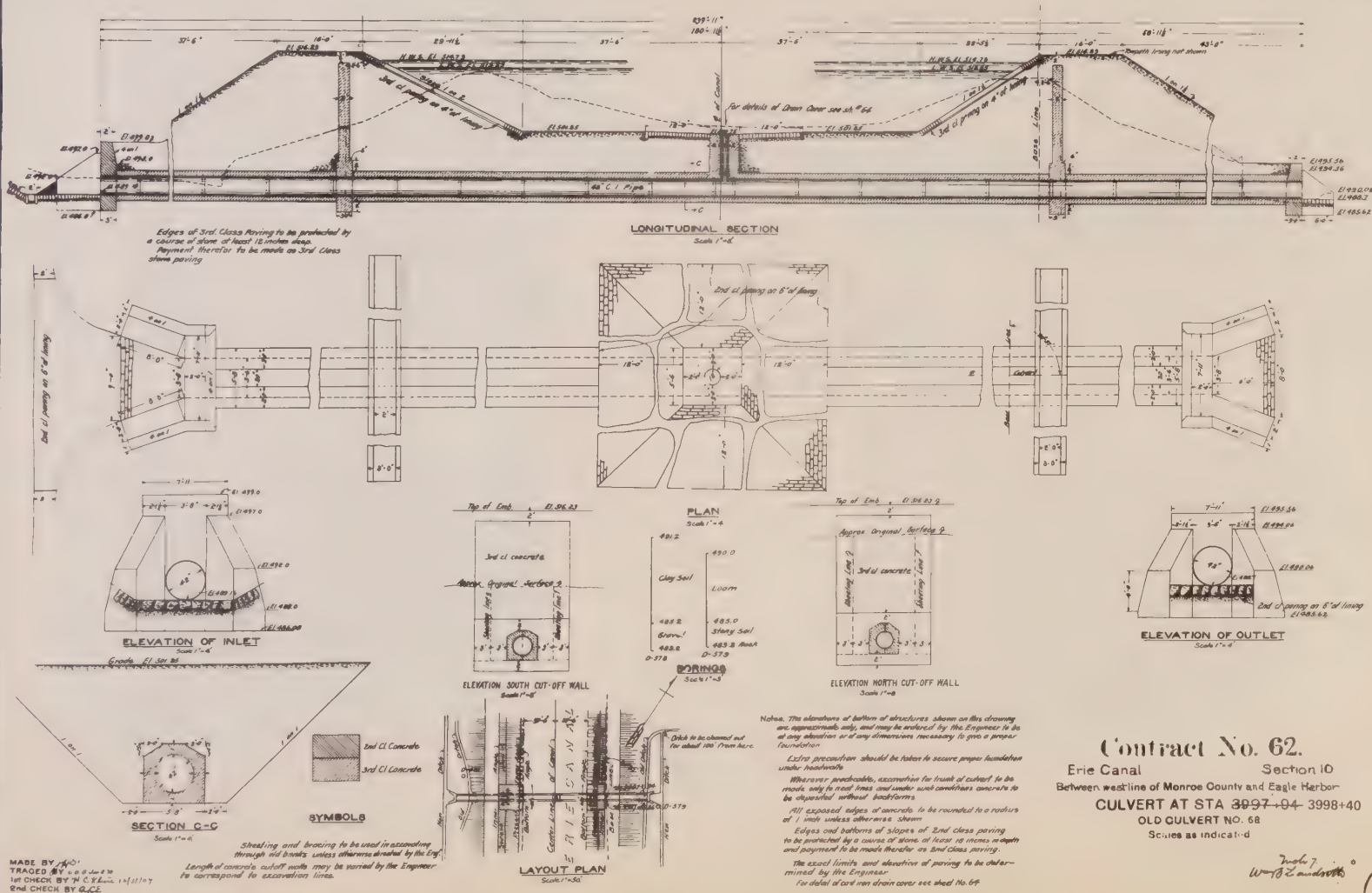
Headwall and wingwalls in fair condition due to many cracks. Sealing at end of wingwalls. Water level dropped 6" by cleaning out channel at exit end.

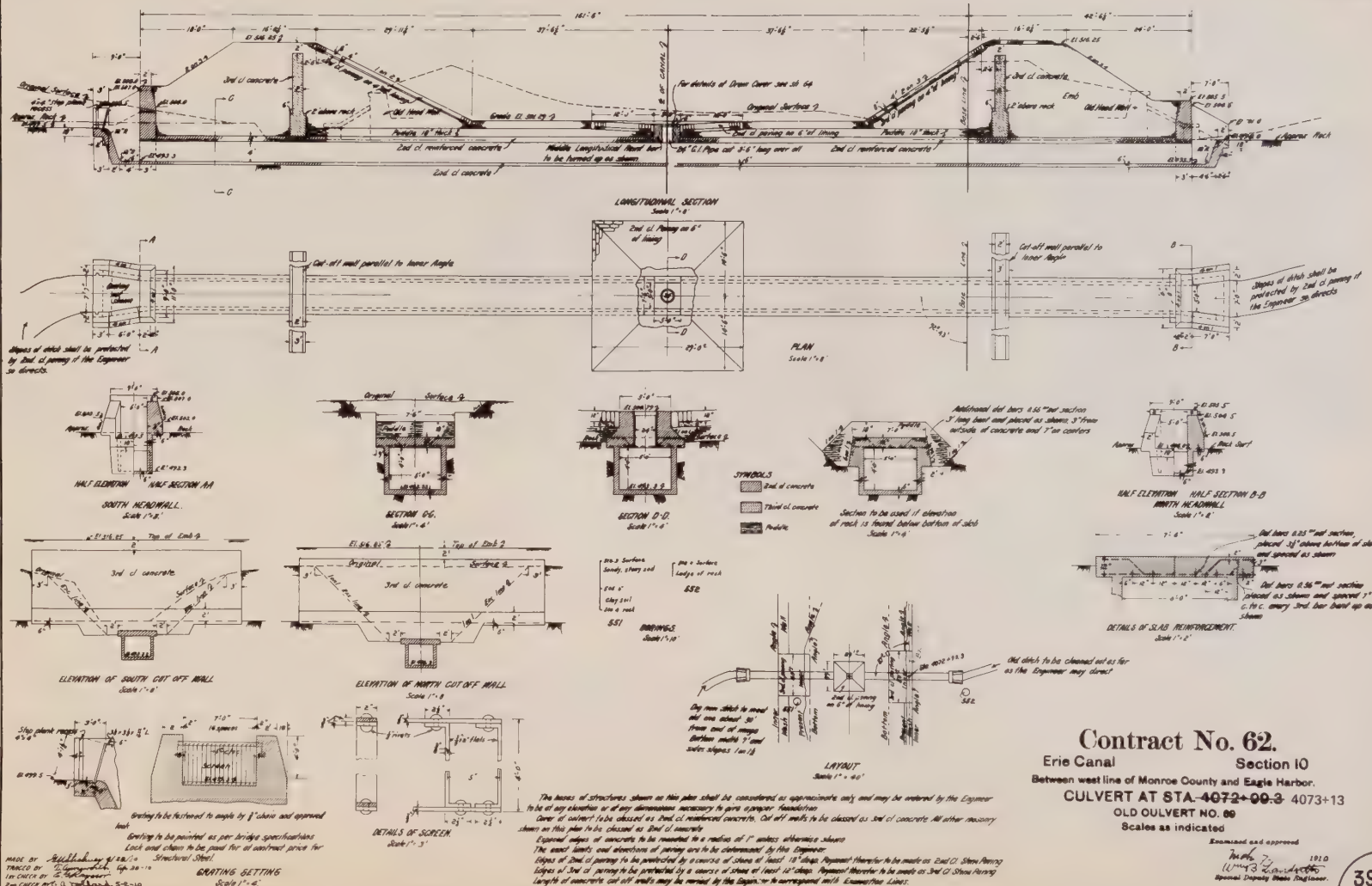


Exit

Headwall and wingwalls in fair condition due to many cracks. Right corner of headwall missing.

Water seemed to be coming out of rock and brush covered embankment next to left wingwall. Water level was dropped 6" by cleaning out channel. Small brook could then be seen coming out through rocks. 1' deep silt where brook meets culvert stream. Most brook water is not from canal.





Culvert #70 (Dive)
178' of 3'9" X 3'9" Concrete Box
Not Inspected



Exit

Headwall and wingwall in good condition. Scaling and a few cracks at low end of right wingwall. No water flow. 40' of garden hose could syphon all culvert water down into an abandoned quarry.

Culvert #71 (Dive)
179' of Triple 7'8" Wide X 4' High
Concrete Boxes
Not Inspected



Exit

The 3 exits for this culvert are located under the Brockville Weir and Waste Gate. Stones and debris were partially plugging exits.

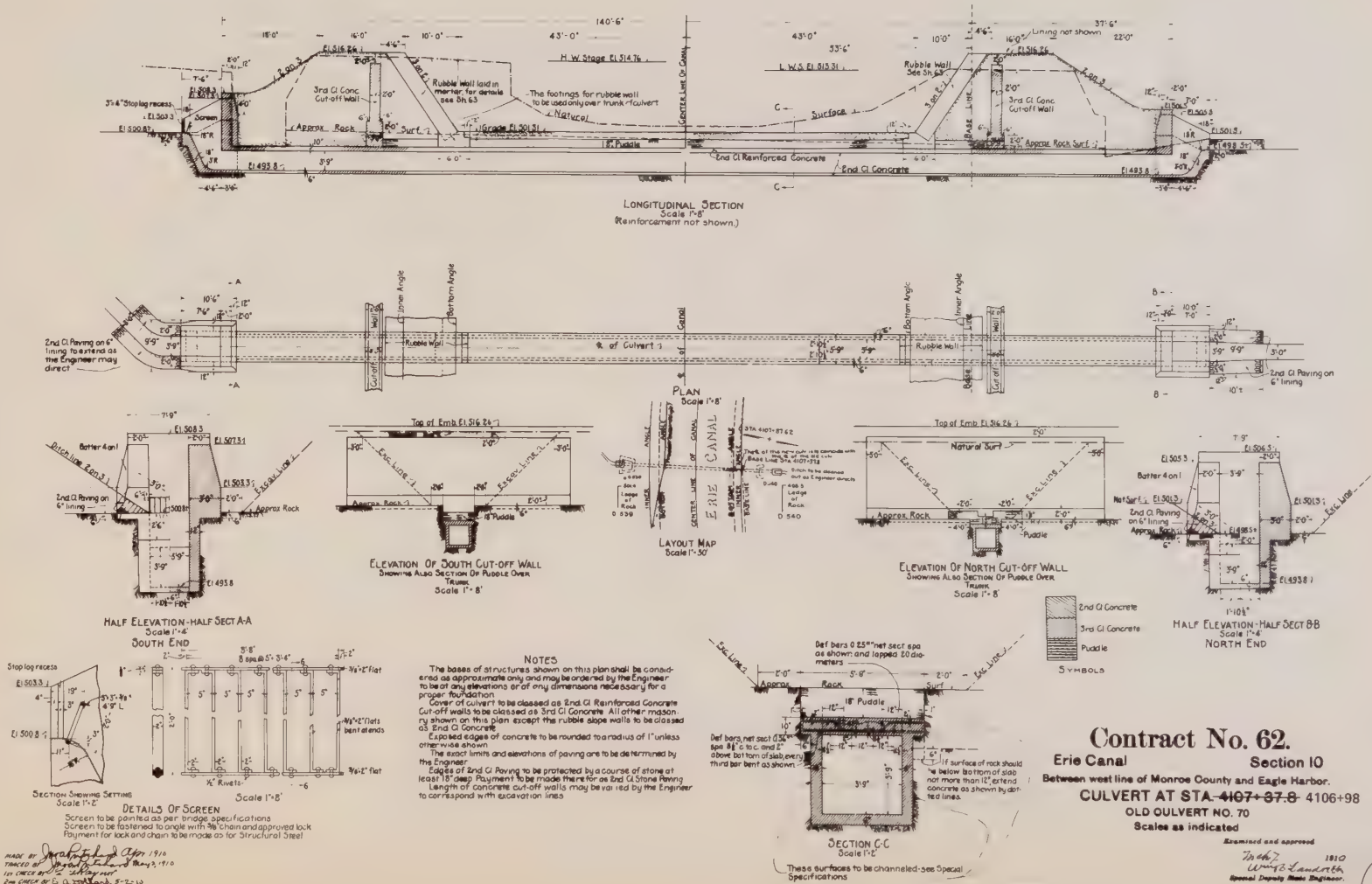
Culvert #72 (Dive)
194' of Twin 42" Cast Iron Pipe
Not Inspected

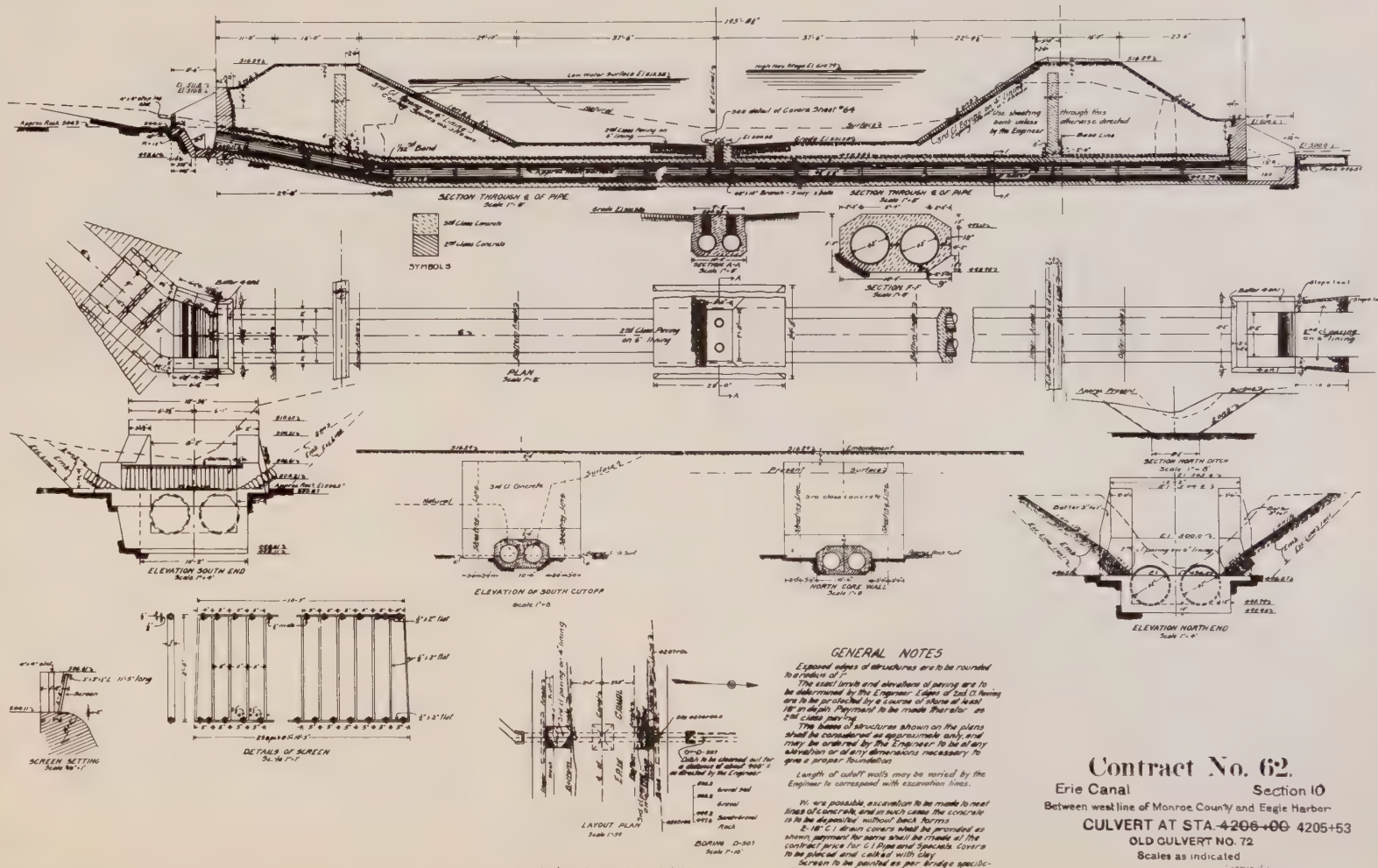
PAGE 256



Exit

Headwall and left wingwall in good condition. Right wingwall in fair to good condition with low end partially scaled away. 1 active syphon.





MADE BY C. L. RAYNER
TRACED BY W. L. L. 1-5-10
IN CHECK BY J. D. S. 7-5-10
RECHECK BY R. L. L. 1-5-10

Edges of 2nd Class Paving are to be protected by a course of stone of least 18 inches deep. Payment therefor to be made as 2nd class stone paving.

Contract No. 62.

Erie Canal Section 10
Between west line of Monroe County and Eagle Harbor

CULVERT AT STA. 4206+00 4205+53

OLD CULVERT NO. 72

Scales as indicated

Contract No.

Wm. J. Landreth
Special Rep. to State

Culvert #73 (Dive) 205' of 3'9" X 3'9"
Concrete Box
Not Inspected



Exit
Headwall and wingwalls in good condition.
Water was backed up by orchard pond. 1
syphon



Culvert exit is at right center of
orchard pond.

Culvert #73½ (Double Dive) 183' of 36"
Cast Iron Pipe
Not Inspected

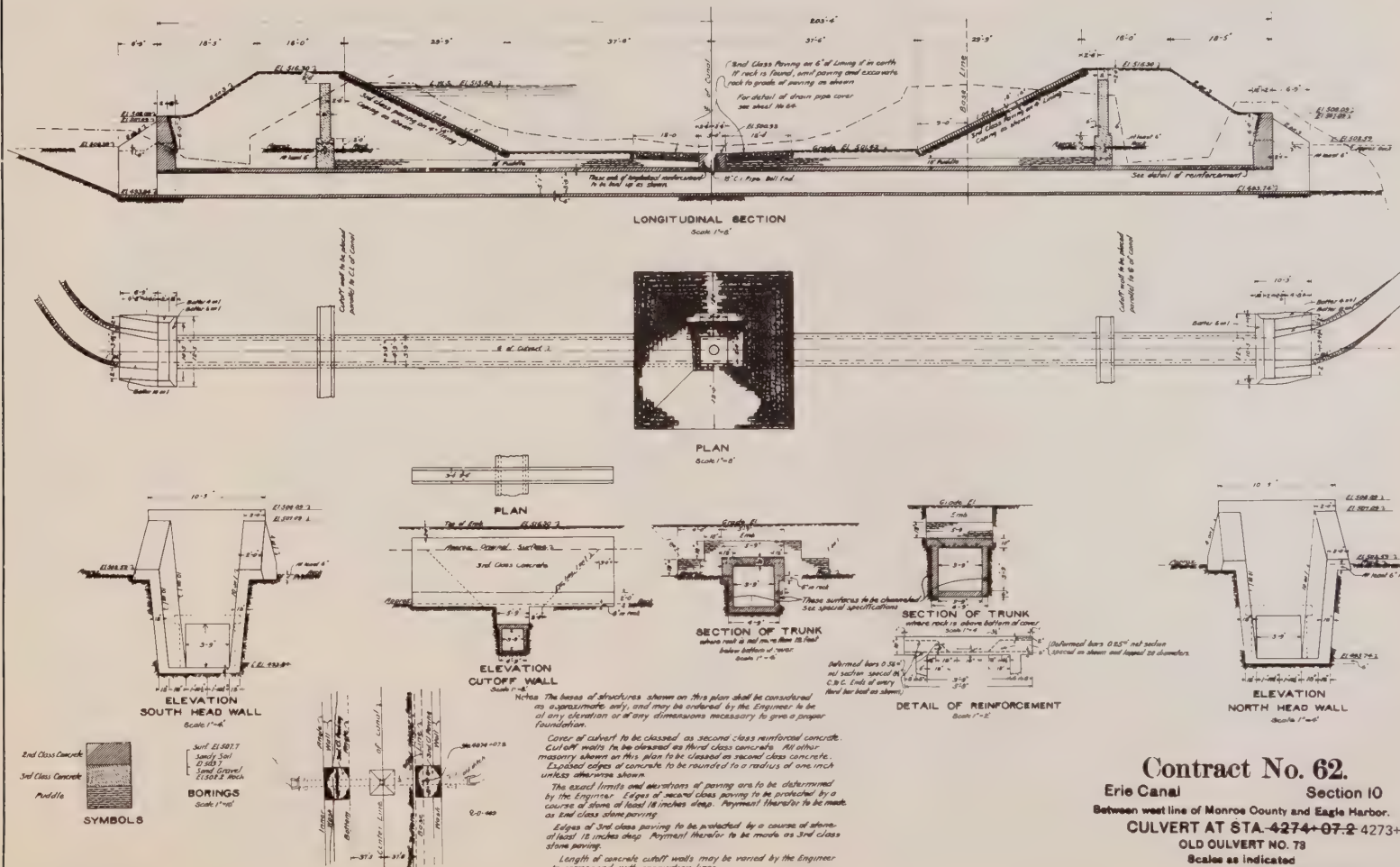


Exit
Headwall and wingwalls in good condition.
Culvert well filled with debris.

Culvert #74 (Dive) 205' of 3'9" X 3'9"
Concrete Box
Not Inspected

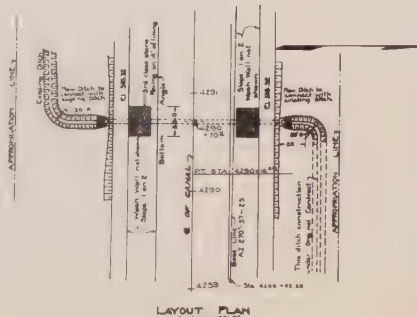
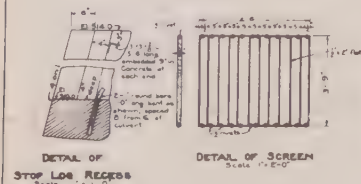
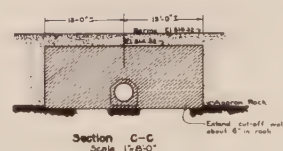
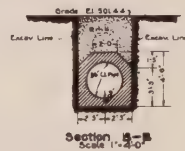
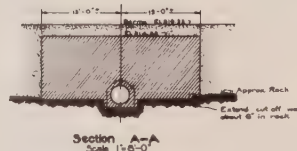
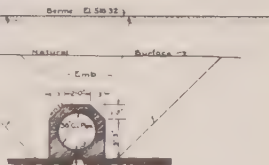
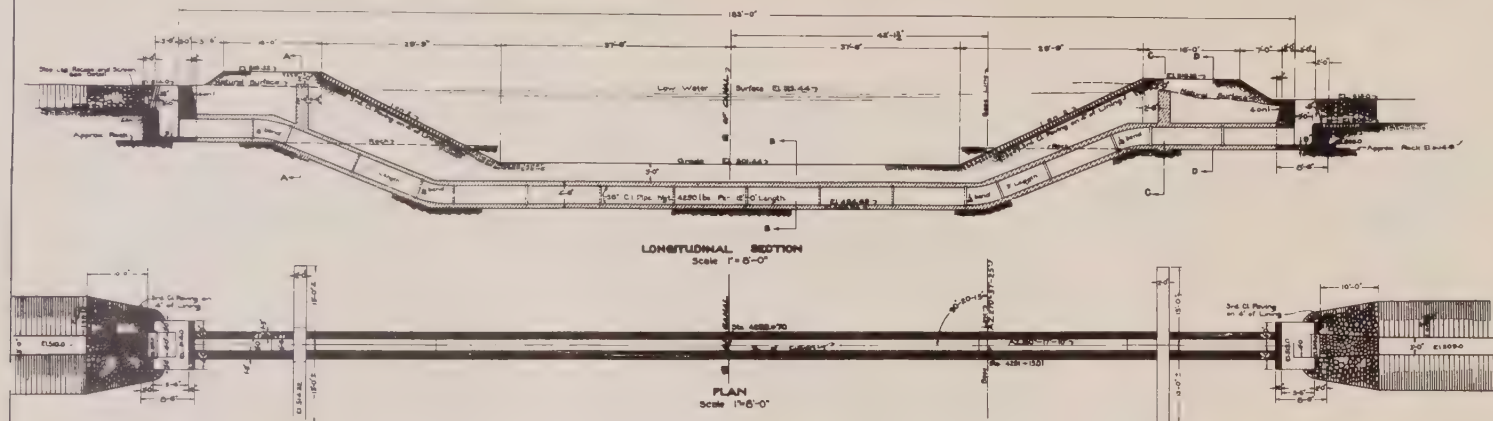


Exit
Headwall and wingwalls in good condition.
Culvert well filled with debris.



MADE BY E. J. Rayner May 1910
TRACED BY C. O. Brown 2-30-10
FOR CHECK BY H. J. Rayner 4/27/14
ONE CHECK BY W. L. Rayner 5-5-10

Examined and approved
1810
Wm. S. Lambeth
Special Deputy State Engineer.



Notes

All exposed edges of concrete to be rounded to radius of 1". Masonry in culvert ceiling and cut-off walls to be 3rd CI concrete. All other masonry shown on this sheet to be 2nd CI concrete.

The exact limits and elevations of Paving are to be determined by the Engineer.

The bases of structures shown on plans, shall be considered as approximate only, and may be ordered by the Engineer to be at any elevation or of any dimensions necessary to give a proper foundation.

Length of cut-off walls may be varied by the Engineer to correspond to excavation lines.

Where possible, excavation to be made to neat lines of concrete and in such cases the concrete is to be deposited without backforms.

Screen to be painted as per bridge specifications.

Screen to be fastened to angle by 1/2" chain and approved lock, payment thereof to be made at Contract price for structural steel.

The ditch to be 3'-0" bottom width, side slopes, 1 on 1, to be protected with 3rd Class Paving as shown.

Edges of 3rd CI Paving to be protected by a course of stone 12" deep and payment is to be made for same at contract price for 3rd CI Paving.

CULVERT NO. 73% Contract No. 62

ALTERATION NO. 4

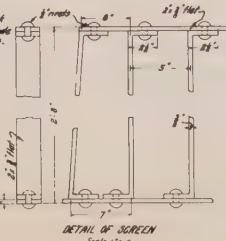
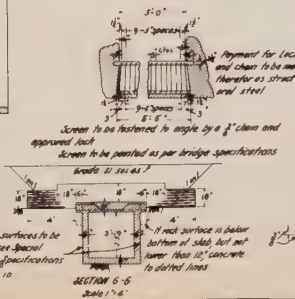
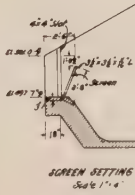
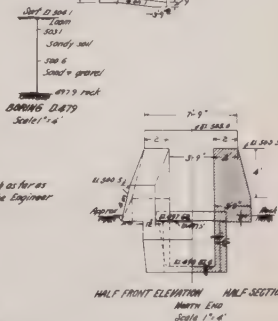
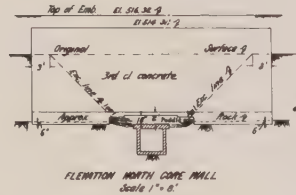
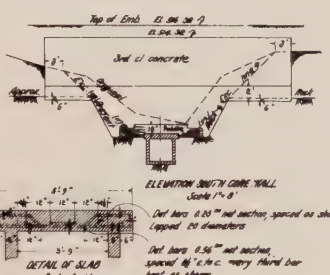
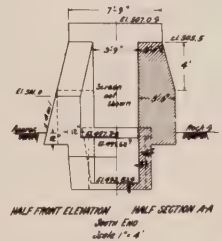
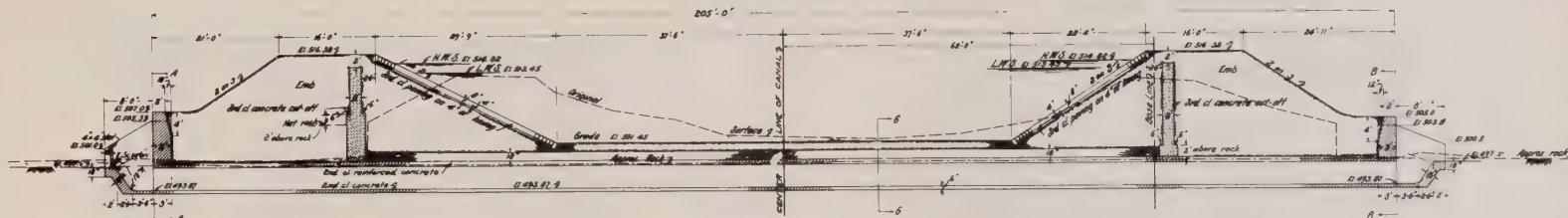
Erie Canal Section 10
DETAIL PLANS OF NEW CULVERT AT
CENTR LINE, STA. 4290+70.73

Scale as Indicated

Examined and approved
R. H. Alexander
Special Resident Engineer
January 31, 1913

Examined and approved
February 1, 1913
Alvin C. Katt
Special Deputy Res. Engineer

MADE BY J. J. J. J.
TRACED BY J. J. J. J.
RECHECKED BY J. J. J. J.
2ND CHECKED BY J. J. J. J.



The basis of structures shown on this plan shall be considered as approximate only, and may be ordered by the Engineer to be of any dimension or of any construction necessary to give a proper foundation.

Cut off wall to be classed as 2nd of reinforced concrete. Cut off walls to be classed as 3rd of concrete. All other masonry shown on this plan to be classed as 2nd of concrete.

Exposed edges of concrete to be rounded to a radius of 1" unless otherwise shown.

The exact limits and elevations of paving are to be determined by the Engineer.

Edges of 2nd of paving to be protected by a course of stone of least 18" deep. Payment herefor to be made as 2nd of Stone Paving.

Edges of 3rd of paving to be protected by a course of stone of least 18" deep. Payment herefor to be made as 3rd of Stone Paving.

Length of concrete cut-off walls may be varied by the Engineer to correspond with excavation lines.

SYMBOLS

| | |
|--|-----------------|
| | 2nd of concrete |
| | 3rd of concrete |
| | Pavement |

Contract No. 62.

Erie Canal Section 10

Between west line of Monroe County and Eagle Harbor.

CULVERT AT STA. 4314+10 4313+68

OLD CULVERT NO. 74

Scale as indicated

MADE BY C. C. ...
TRACED BY T. C. ...
IN CHARGE OF ...
AND CHECKED BY ...

Examined and approved
In Chg.
Special Deputy State Engineer



Exit

Headwall and wingwalls in good condition. Clean water flows into a 12" pipe and heads underground toward house. Culvert well filled with leaves and debris. Board fencing and pipe seems to indicate that water is used by land owner (Kirby).



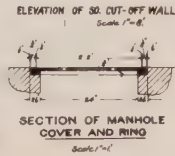
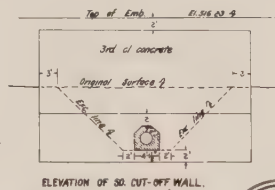
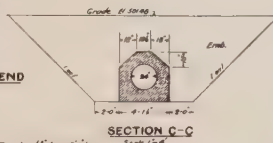
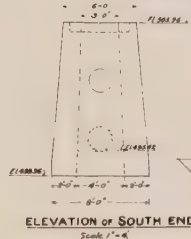
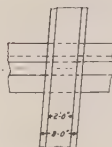
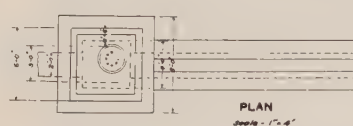
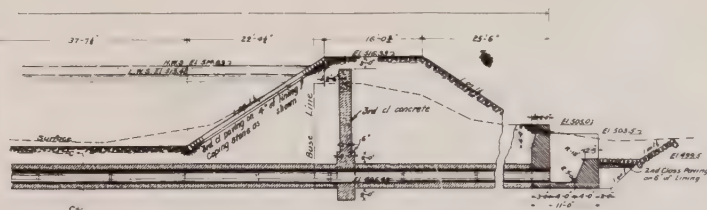
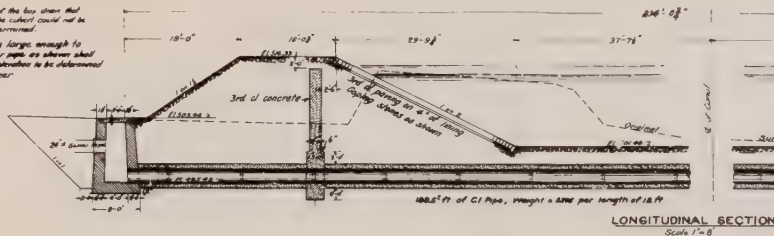
Small well found about 100' east of Culvert #75 at the toe of the north embankment. Water level was 3' below ground. No flow noticed.



Exit

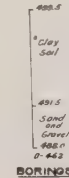
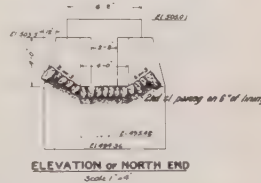
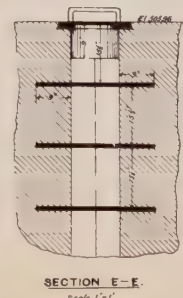
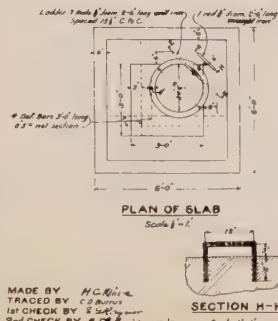
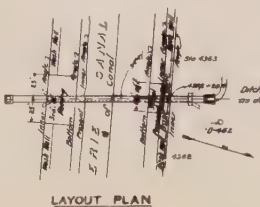
Headwall and wingwalls in good condition. End of left wingwall broken off. Pipe half full of water.

The structure of the box shown that emerges into the culvert could not be definitely determined.
The opening large enough to admit a horse, upon its whether about be left of an structure to be determined by the Engineer.



Note: The elevations of the bottom of structures shown on this drawing are approximate only and may be ordered by the Engineer to be placed at any elevation necessary for a proper foundation. Extra precaution must be taken to secure proper foundation under hand walls. All exposed edges of concrete to be rounded to a radius of 1 inch. Where possible, accessories to be made in round lines of concrete and in such cases the concrete is to be deposited without back forms. Length of concrete cutoff may be varied by the Engineer to correspond to excavation lines.

Edges of 3rd class concrete to be protected by a course of paving stone at least 18" in length. Payment to be made therefor on 2nd class paving. Edges of 3rd class concrete to be protected by a course of stone of least 18" deep Payment therefor to be made on 3rd class paving. Excavation through old north bank to be made with shoring and bracing as is otherwise ordered by the Engineer.



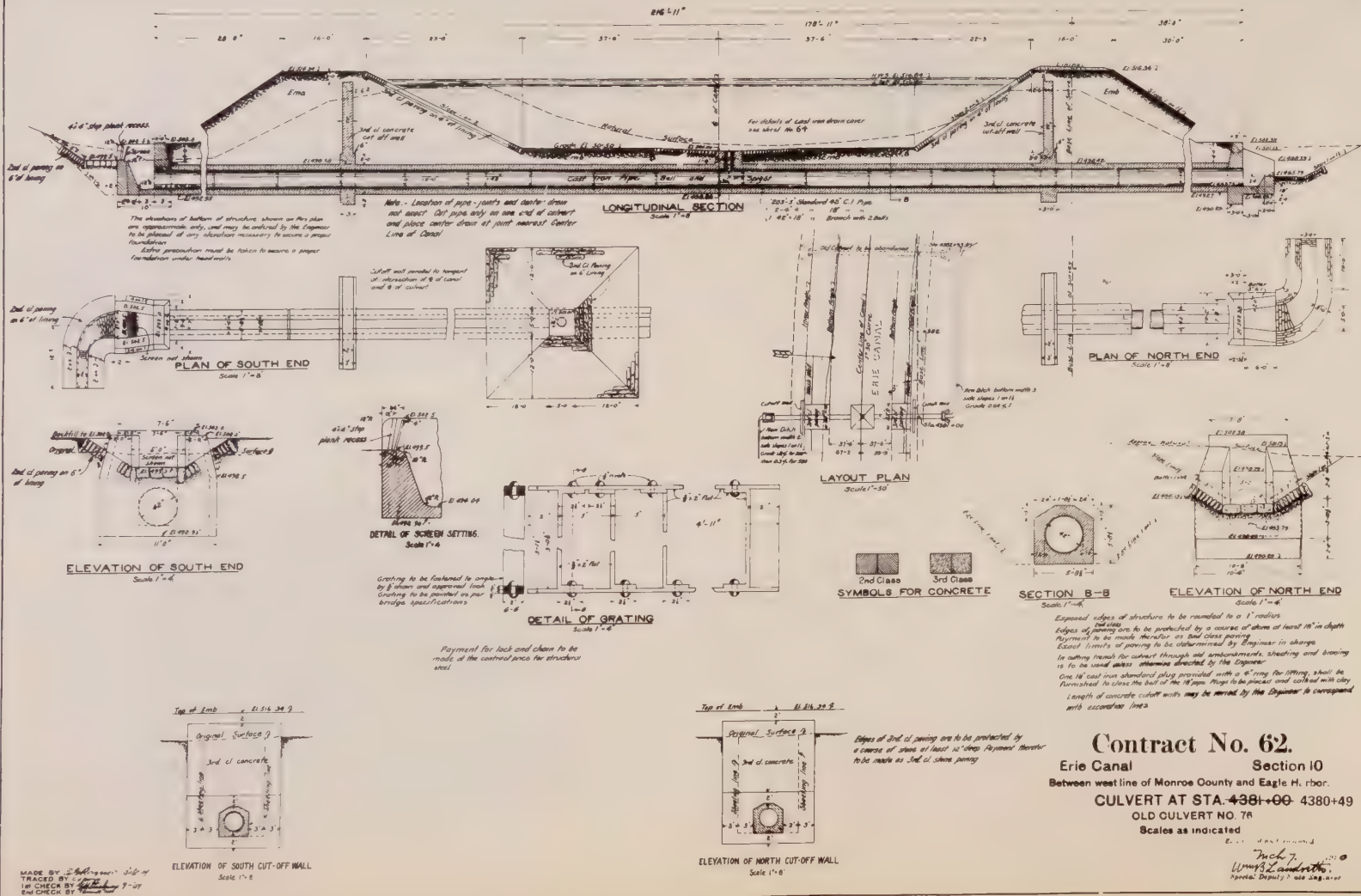
SYMBOLS FOR CONCRETE

2nd Class
3rd Class

Contract No. 62.
Erie Canal Section 10
Between west line of Monroe County and Eagle Harbor
CULVERT AT STA. 4362+28.4 4361+81
OLD CULVERT NO. 75
Scale as indicated

MADE BY H.C. Rife
TRACED BY C.D. Burns
1st CHECK BY S. S. S. S.
2nd CHECK BY S. S. S. S.

Revised 10-1-11
J. S. S. S.
Wm. S. S. S.





Looking South-Exposed Top of Culvert, Apr. 1976
Albion Waste Gate and Weir in background. Area
sandbagged off for repairs. Concrete lining over
top of culvert has mostly disappeared.

In the Spring of 1976, water was seen spouting up into the nearly drained canal when the culvert was flowing full. Later, the area above the culvert was sandbagged off and a hole down between stone blocks was found. The downstream channel was then cleaned out so the culvert could be entered and the entrance area was also cleaned of debris. The hole was patched with concrete and the canal filled. In late August, a large quantity of water was seen spouting out a 30-40' long section of the east barrel west wall near the south end. The west barrel could only be entered a short distance from the exit end. It was plugged by a 5-6' diameter tree trunk wedged between the floor and ceiling. On Sept. 15 the waste gates were closed and our first thorough inspection was made.



Entrance

Albion Waste Gate and Weir overhead. No airspace existed prior to cleaning of downstream channel. Note stones missing under middle gate in 1976. Compare with 1975 photo in Albion Waste Gate and Weir section.

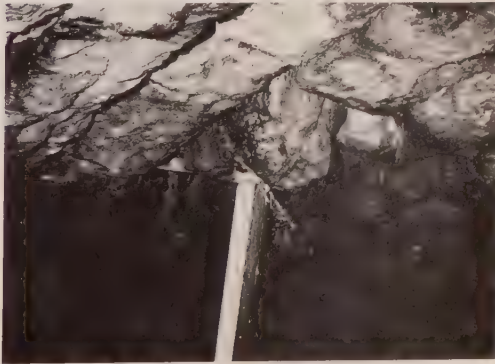


Exit

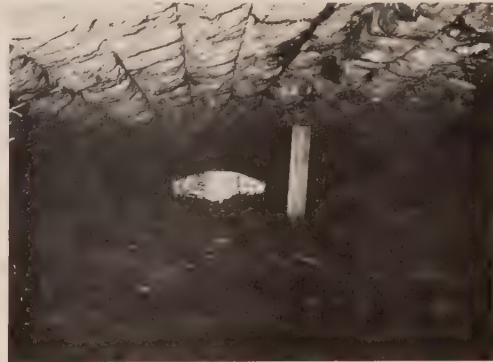
Headwall and wingwalls in good condition with a few cracks. Only 8" of airspace existed at exit prior to cleaning of downstream channel.



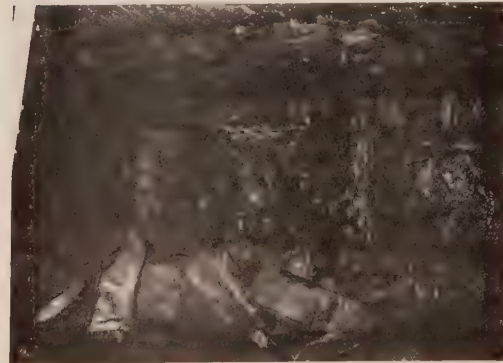
East Barrel-Looking South From Exit
Concrete arch had a few scattered efflorescent covered cracks. Stones in culvert and in exit channel appeared to be the remains of an old mill that existed at the culvert entrance.



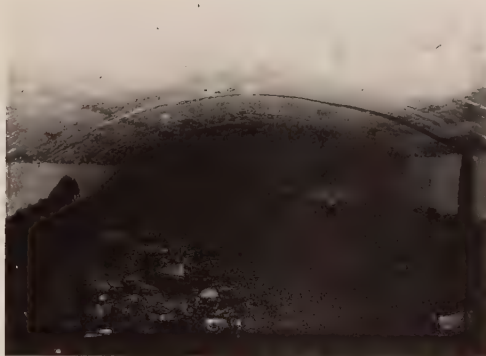
Ceiling of East Barrel
Large board used to prop up tilted and partially fallen stone block while overhead concrete repairs were made in the Spring of 1976. Two other adjacent stone blocks were partially missing. New concrete was seen high up in joints.



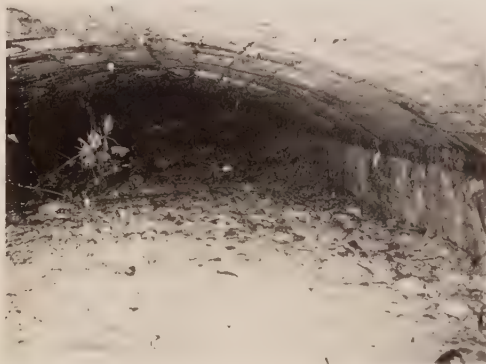
East Barrel-Looking South
Note row of ceiling blocks higher than others. Either the bottom sections of these blocks have fallen off or the blocks were never lowered to correct position.



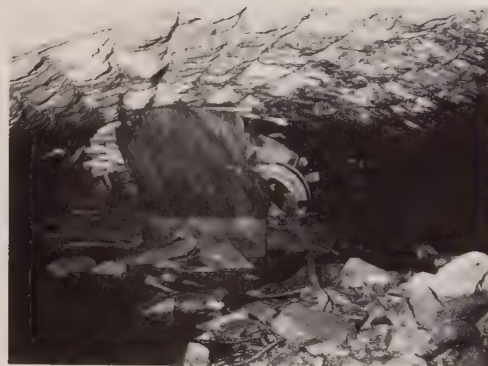
West Wall of East Barrel Near South End
Two weeks prior, a large quantity of water was seen coming through a 30-40' long section of the lower wall joint. All leaks had now stopped.



Plugged West Barrel - Looking South From Exit
Concrete arch had a few scattered
efflorescent covered cracks



Plugged West Barrel - Looking North
Behind the plug, the culvert floor has filled up
with rocks and gravel. Another stone block exists
below wall at right. Compare with east barrel
wall photo.



Plugged West Barrel
5-6' diameter tree trunk plugged culvert.
30' or more of debris was piled up behind trunk.

West Barrel - hole 1' square by 1' deep existed in a stone block 3' and 8' in from the entrance. Constant scattered dripping throughout. Drip size streams existed in 3 or 4 areas mainly in south half. Numerous joints open between stones. A few cracked blocks at entrance. Exit plugged.

East Barrel - about 6 broken blocks within 10' of the entrance, but only 2 have partially fallen out. One block has slipped down 2". Numerous joints open between blocks. Many constantly dripping streams mainly in south half. Board used to prop up ceiling block while repairs were made. No leaks in area of repair. Heavy leak in west wall seen 2 weeks previous had stopped.

Sections of both barrels, mainly near the entrance, need repair. Work on unplugging the west barrel has been started. Both barrels need cleaning. Both north end concrete arches contained a few cracks, but were still in fair to good condition.

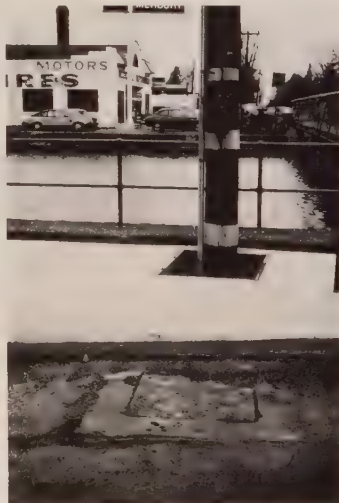
Culvert #78 (Dive) 216' of 42" Cast Iron Pipe
Not Inspected



Exit

Headwall and wingwalls in good condition. Pipe half full of silt.

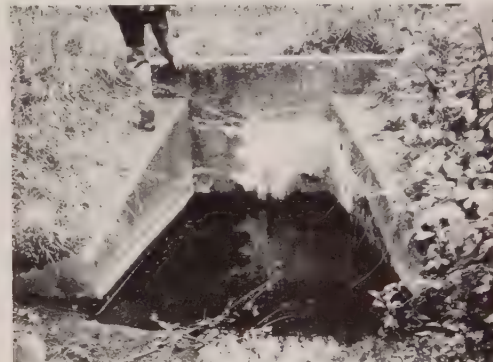
Culvert #79 (Dive) 144' of 30" Cast Iron Pipe
Not Inspected



Entrance

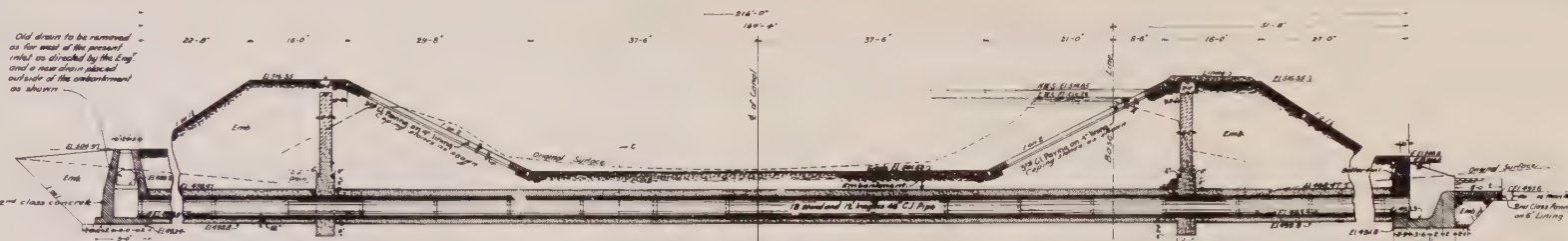
Square manhole cover in foreground is entrance. Exit manhole is under car behind telephone pole on north side of canal. This Town of Albion storm sewer was allegedly cleaned out in 1974.

Culvert #80 (Dive) 190' of 42" Cast Iron Pipe
Not Inspected



Exit

Headwall and wingwalls in fair condition due to many cracks. Culvert well filled with silt and drainage channel filled with vegetation.



Note
The elevations of bottom of structures shown on this drawing are approximate only and may be ordered by the Engineer to be of any elevation or of any dimensions necessary to give a proper foundation.

Extra precaution should be taken to assure proper foundation under head walls.

Whenever possible, excavation for trunk of culvert to be made only to road lines and under such conditions concrete to be deposited without foundation.

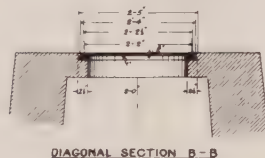
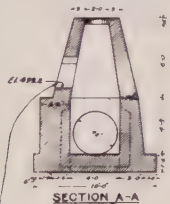
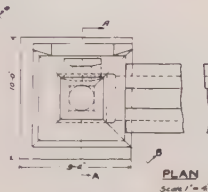
All exposed edges of concrete to be rounded to a radius of 3 in. unless otherwise shown.

Edges and bottom of slopes of 2nd Class paving to be finished by a corner of 1/2 in. in depth and improved to be made stronger as 2nd Class paving.

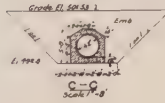
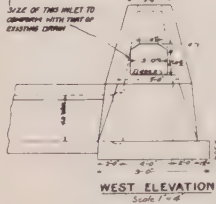
The exact limits and elevation of paving to be determined by the Engineer.

Length of concrete cut-off walls may be ordered by the Engineer to be varied to determine limits.

Edges of 2nd Class paving to be protected by a course of stone or gravel at least 12 in. thick to be made as 2nd Class paving.

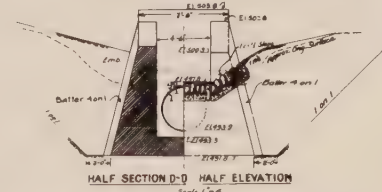
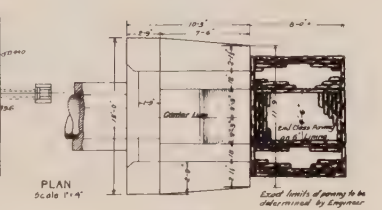
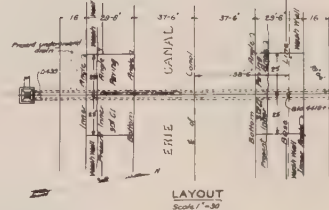


DETAIL OF TOP OF MANHOLE AND COVER
Scale 1"=4'

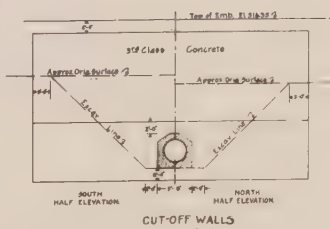


BOIRING

| | |
|------------|-------------|
| 1st Class | 2nd Class |
| 3rd Class | 4th Class |
| 5th Class | 6th Class |
| 7th Class | 8th Class |
| 9th Class | 10th Class |
| 11th Class | 12th Class |
| 13th Class | 14th Class |
| 15th Class | 16th Class |
| 17th Class | 18th Class |
| 19th Class | 20th Class |
| 21st Class | 22nd Class |
| 23rd Class | 24th Class |
| 25th Class | 26th Class |
| 27th Class | 28th Class |
| 29th Class | 30th Class |
| 31st Class | 32nd Class |
| 33rd Class | 34th Class |
| 35th Class | 36th Class |
| 37th Class | 38th Class |
| 39th Class | 40th Class |
| 41st Class | 42nd Class |
| 43rd Class | 44th Class |
| 45th Class | 46th Class |
| 47th Class | 48th Class |
| 49th Class | 50th Class |
| 51st Class | 52nd Class |
| 53rd Class | 54th Class |
| 55th Class | 56th Class |
| 57th Class | 58th Class |
| 59th Class | 60th Class |
| 61st Class | 62nd Class |
| 63rd Class | 64th Class |
| 65th Class | 66th Class |
| 67th Class | 68th Class |
| 69th Class | 70th Class |
| 71st Class | 72nd Class |
| 73rd Class | 74th Class |
| 75th Class | 76th Class |
| 77th Class | 78th Class |
| 79th Class | 80th Class |
| 81st Class | 82nd Class |
| 83rd Class | 84th Class |
| 85th Class | 86th Class |
| 87th Class | 88th Class |
| 89th Class | 90th Class |
| 91st Class | 92nd Class |
| 93rd Class | 94th Class |
| 95th Class | 96th Class |
| 97th Class | 98th Class |
| 99th Class | 100th Class |



2nd Class Concrete
3rd Class Concrete
SYMBOLS



Contract No. 62.

Erie Canal Section 10

Between west line of Monroe County and Eagle Harbor

CULVERT AT STA. 4418 + 40.6 11

OLD CULVERT NO 78

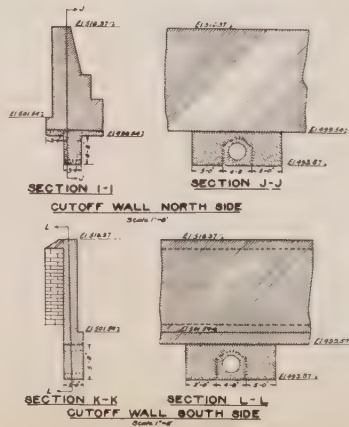
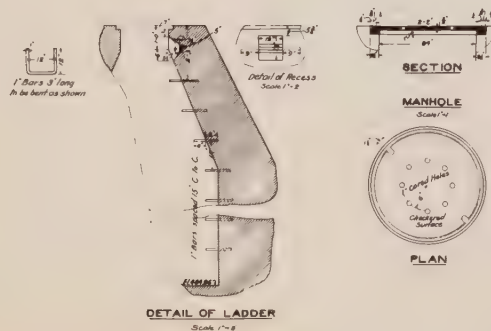
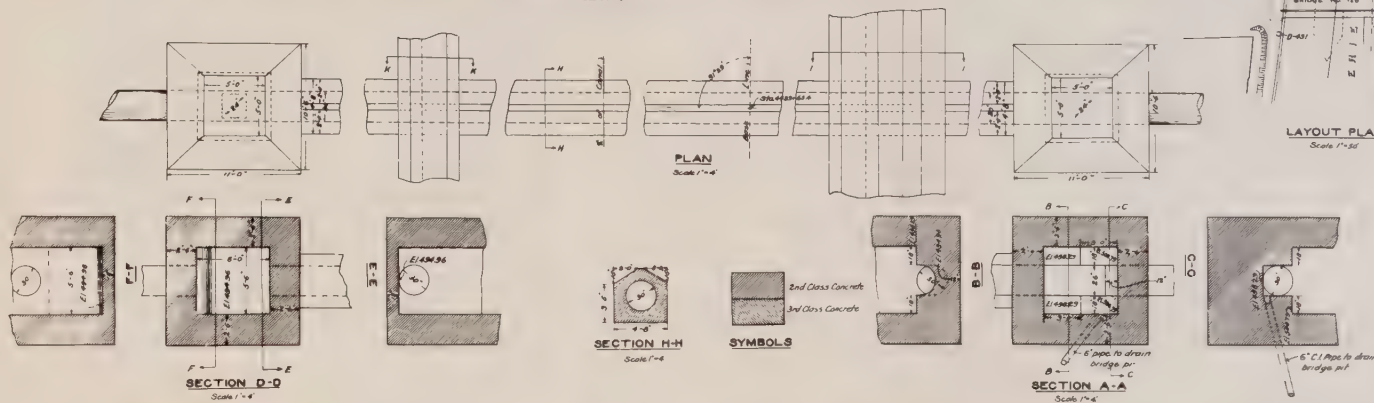
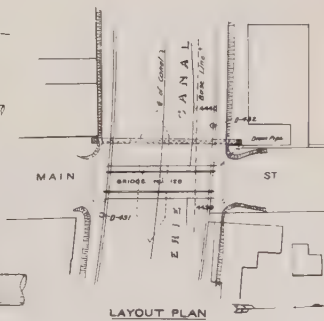
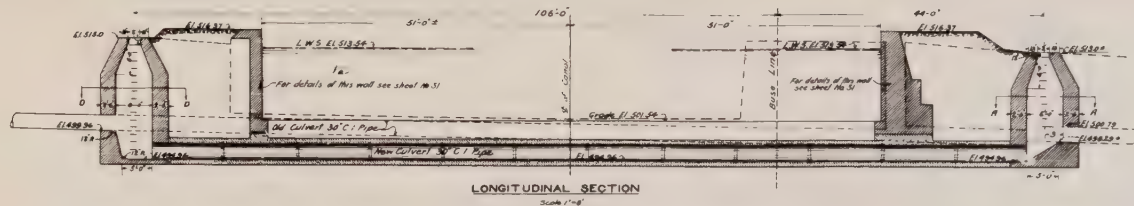
Scales as indicated

Exam'd by approved

Wm B. R. 1810

DEPT. OF HIGHWAYS, N.Y.

MADE BY Sullivan & Co.
TRACED BY Sullivan & Co.
1st CHECK BY Sullivan & Co.
2nd CHECK BY Sullivan & Co.



Note: The boxes of structure shown on this plan shall be considered as approximate only, and may be ordered by the Engineer to be of any dimension or of any dimensions necessary to give a proper foundation.

Concrete to be 3rd and 3rd class as shown. All exposed ends to be rounded to a radius of 1/2 inches otherwise shown.

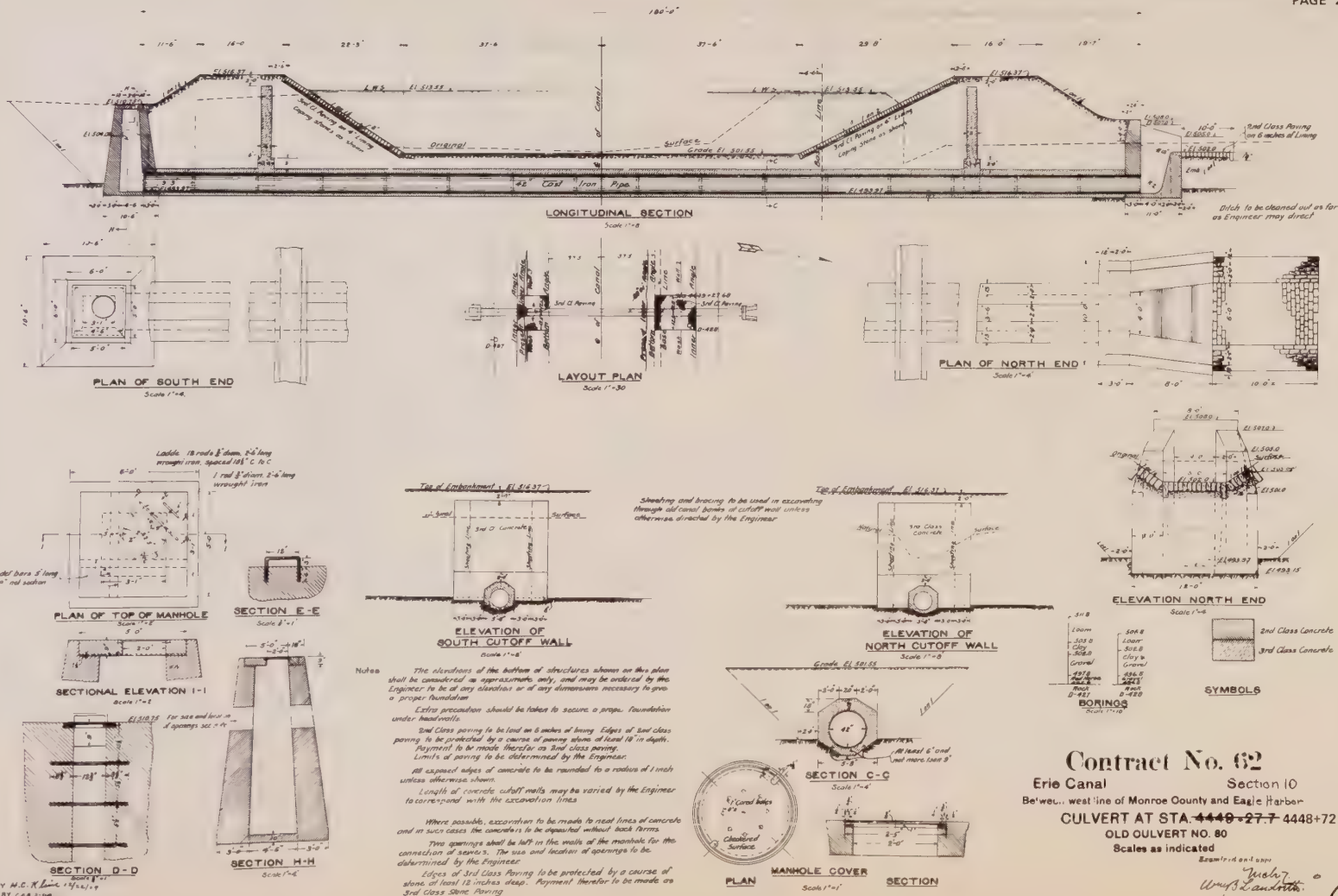
All inlet and outlet of culvert, where new culvert joins the old culvert, the Engineer may change elevations if necessary.

Corn must be taken to have a good junction between old and new pipes.

Two man must be taken to have the old well as south side of canal properly supported, and if considered necessary by the Engineer, a concrete footing may be placed under the well.

The six inch pipe used to drain and pipe into manhole is to be located by the Engineer and placed as shown.

Contract No. 62.
Erie Canal **Section 10**
 Between west line of Monroe County and Eagle Harbor.
CULVERT AT STA. 4439 +65.4 20
OLD CULVERT NO. 79
 Scales as indicated





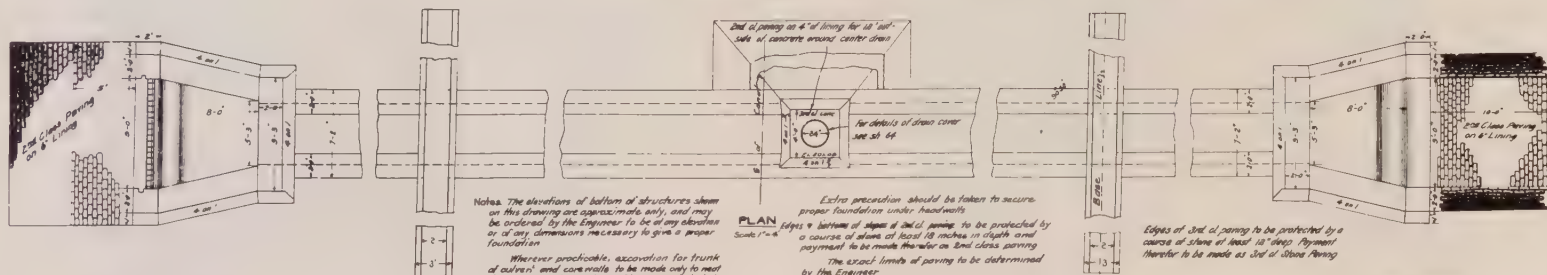
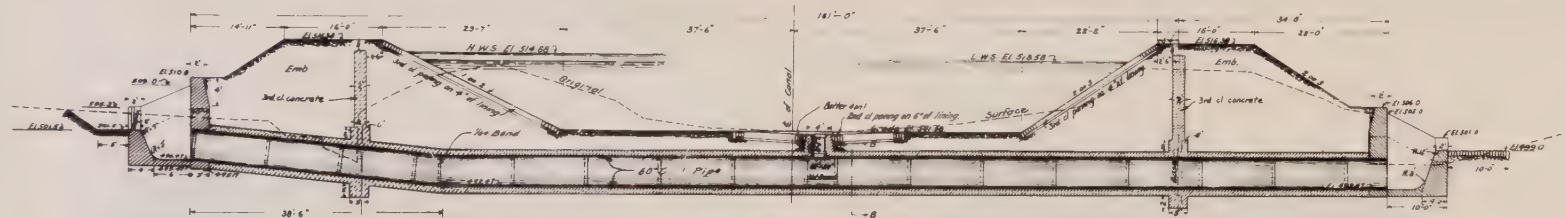
Exit

Headwall and wingwalls in good condition above horizontal crack or construction joint. Efflorescent covered cracks in vicinity of crack and end of left wingwall partially scaled away. 7-3" syphons, 3 active.



Exit

Above the water line, headwall and most of wingwalls in good condition. 6" deep scaling on headwall and wingwalls at water line. Low ends of wingwalls scaling away. 3-3" syphons, 1 active. Note embankment erosion by active syphon behind left wingwall.



Notes: The elevations of bottom of structures shown on this drawing are approximate only, and may be ordered by the Engineer to be at any elevation or at any dimensions necessary to give a proper foundation.

Wherever practicable, excavation for trunk of culvert and concrete walls to be made only to real times, and under such conditions, concrete to be deposited without headforms.

Extra precaution should be taken to secure proper foundation under headwalls.

Edges & bottom of slope of 3rd cl. paving to be protected by a course of stone of least 18 inches in depth and payment to be made therefor on 2nd class paving.

The exact limits of paving to be determined by the Engineer.

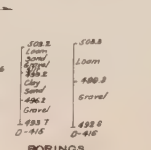
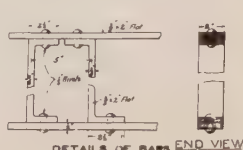
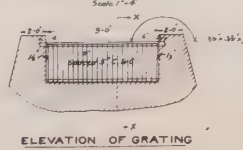
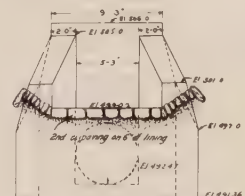
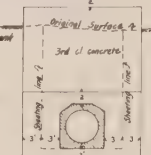
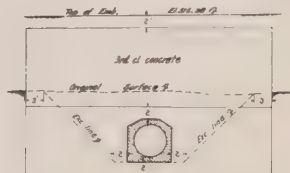
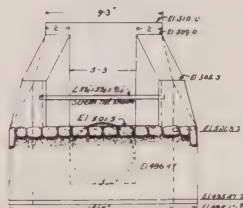
Length of concrete cutoff walls may be varied by the Engineer to correspond to fluctuating flows.

All exposed edges of concrete are to be rounded to a radius of 1 inch unless otherwise shown.

Shading and hatching to be used in accordance through and north arrow unless otherwise directed by the Engineer.

SYMBOLS

2nd Class Concrete
3rd Class Concrete



Contract No. 62.

Eric Canal Section 10

Between westline of Monroe County and Eagle Harbor

CULVERT AT STA. 4478+85.6 40

OLD CULVERT NO. 82

Scales as indicated

Examined and approved
J. H. Smith
J. H. Smith
J. H. Smith

MADE BY
TRACED BY
1st CHECK BY
2nd CHECK BY

The grating is to be fastened to angle by a chain and approved lock and shall be provided in per design specifications.

Payment for lock and chain to be made at the contract price for structural steel.



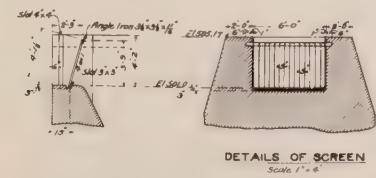
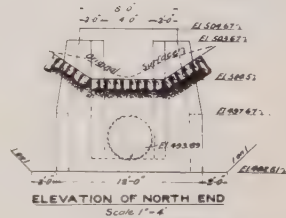
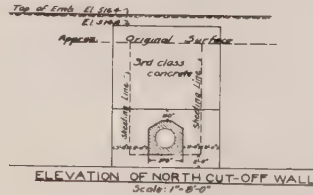
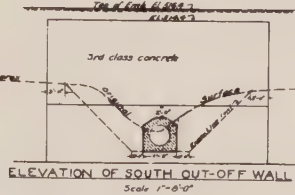
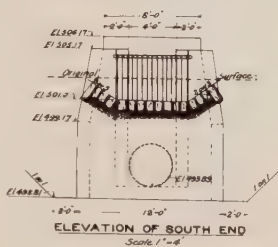
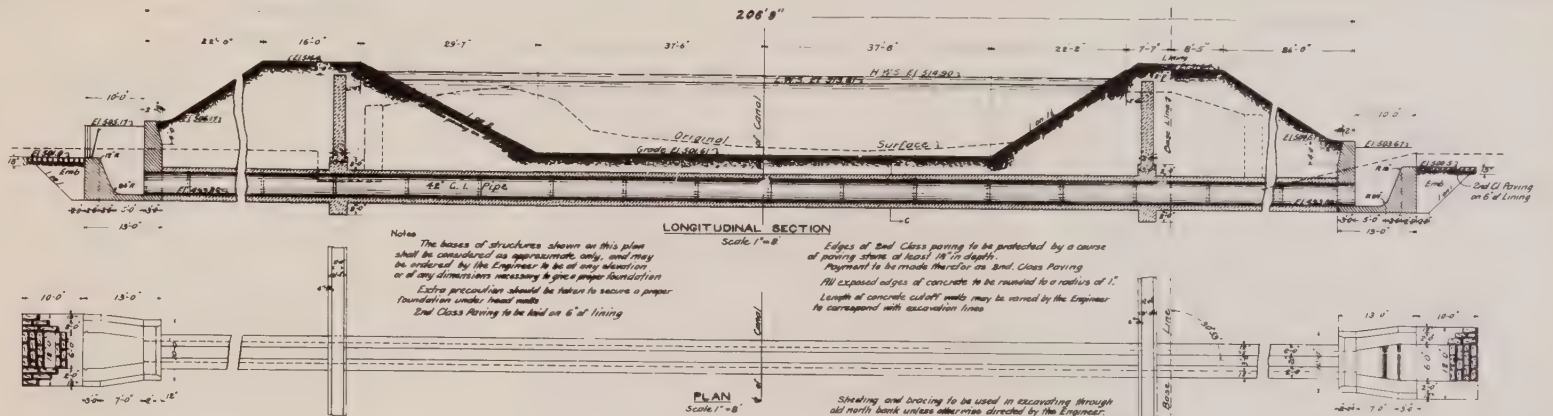
Exit

Headwall and wingwalls in fair to poor condition. Concrete was all cracked, but holding together. Culvert well filled with debris and drainage channel filled with vegetation.

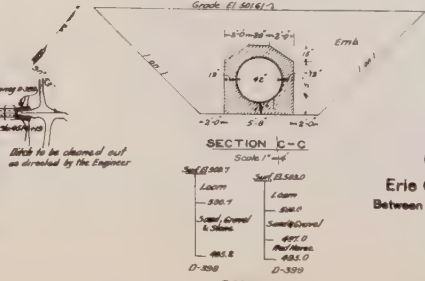
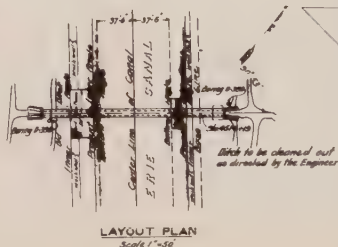


Exit

Headwall and wingwalls generally in good condition. A few efflorescent covered cracks.



Screen to be painted as per Bridge Specifications.
Screen to be fastened to angle by 3" chain and approved lock.
Payment for lock and chain to be made at the contract price for structural steel.

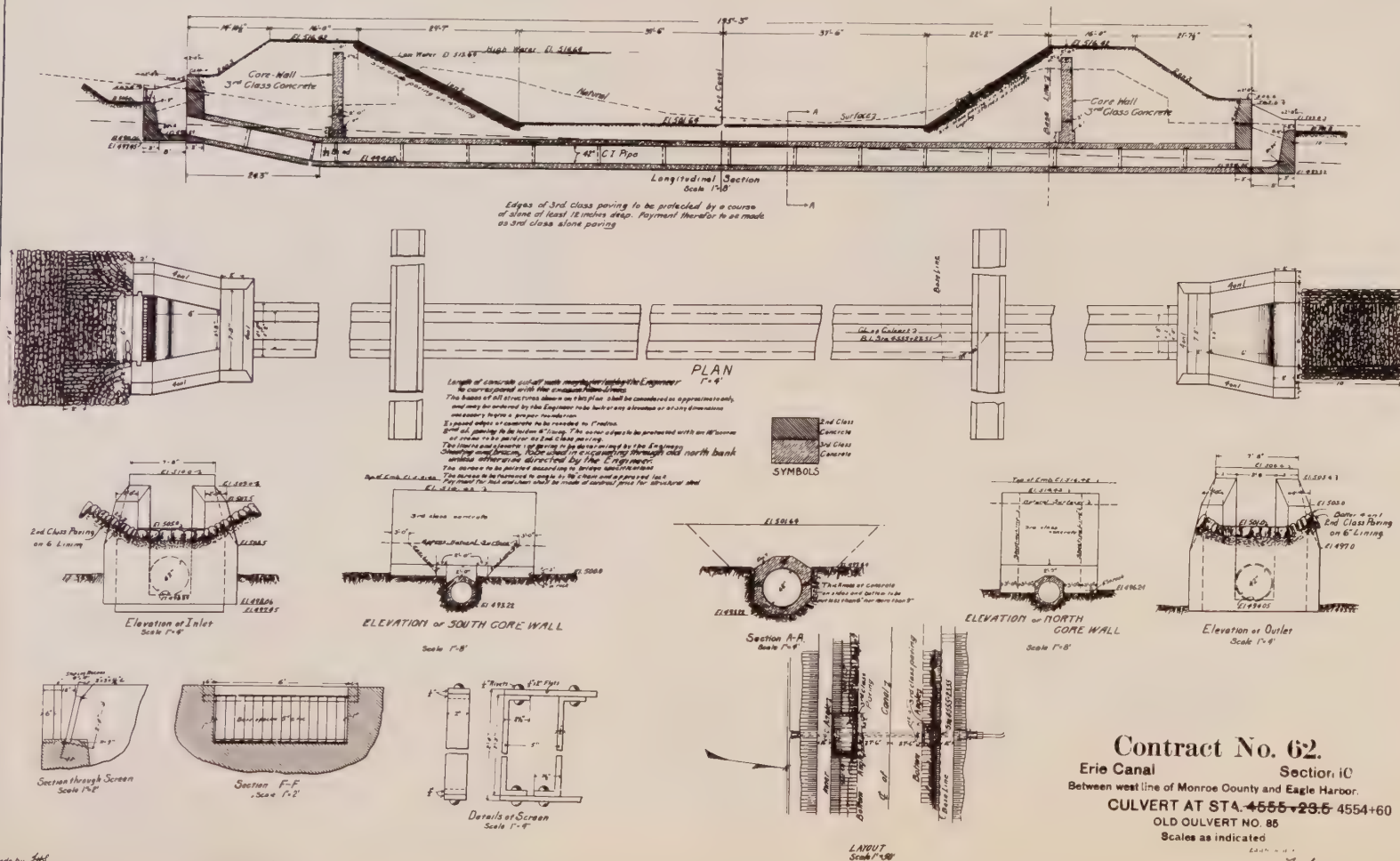


Contract No. 62.
Erie Canal Section 10
Between west line of Monroe County and Eagle Harbo
CULVERT AT STA. 4514+10.12
OLD CULVERT NO. 84
Scales as indicated

MADE BY H.C. Rine
TRACED BY C.J. Burns
1st CHECK BY J.H. Hays
2nd CHECK BY J.H. Hays

BORINGS
Scale 1"=5'

Examined and approved by
Wm. A. Landwehr
Special Ins.



Contract No. 62.

Erie Canal

Section 10

Between west line of Monroe County and Eagle Harbor.

CULVERT AT ST. 4555+29.5 4554+60

OLD CULVERT NO. 85

Scales as indicated

Made by J.H.H.
Traced by J.D. 3/4/11
1st Check by Eaton
2nd Check by W.D. 3/4/11

Drawn on tracing by J.H.H. 4/1/11

E.D.H. 4/1/11

Wm. J. Landwehr



Entrance

Headwall and left wingwall in good condition. Right wingwall scaled along top. This concrete box entrance was probably built soon after the Eagle Harbor Trough was repaired in 1927. It prevented debris from blocking the entrance (See Eagle Harbor Trough). Old headwall is at right.



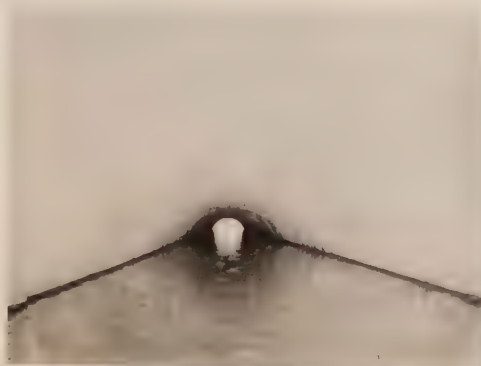
Looking South From Exit

Arch keystone next to concrete headwall has slipped down 2". Keystone has also slipped 2" at entrance. Cobwebs hang from ceiling by slipped block.



Exit

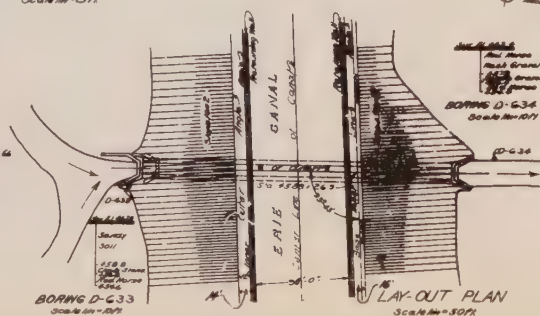
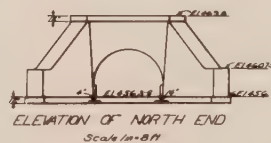
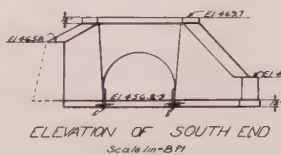
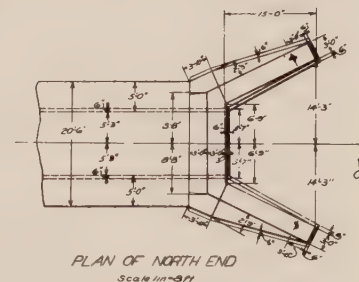
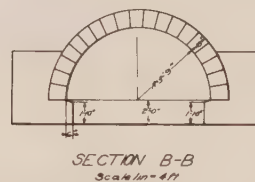
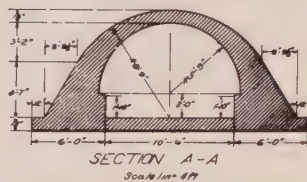
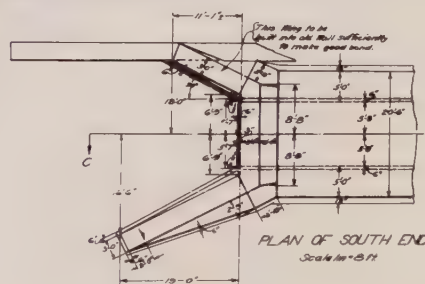
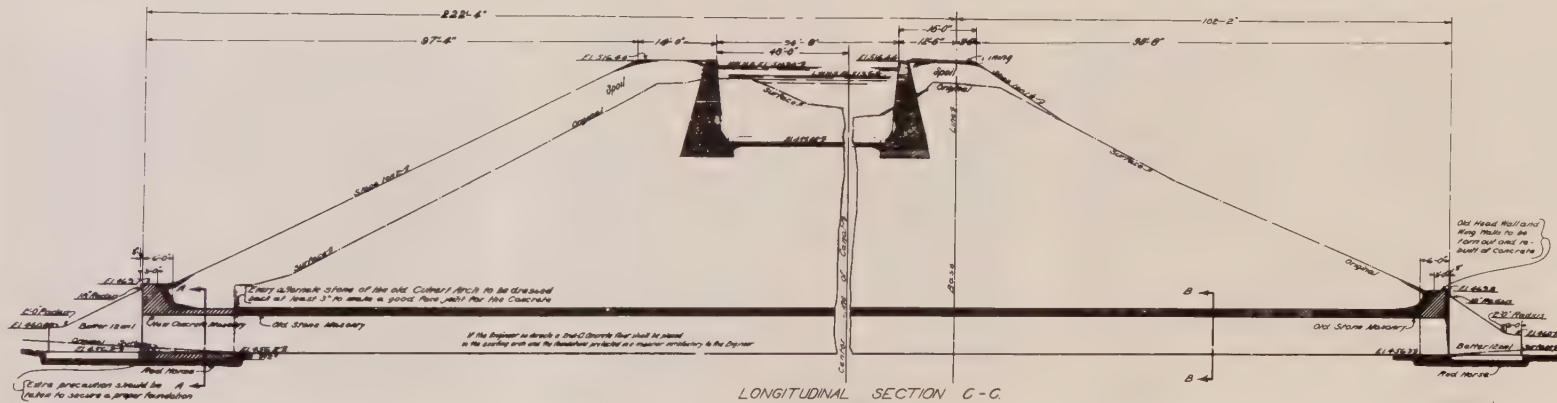
Headwall and wingwalls in fair to good condition with some efflorescent covered cracks. Horizontal crack about 1' above top of arch and vertical crack over top of arch.



Looking North From Entrance

Slipped keystone can just be seen about 20' into the arch section. Culvert inspected by raft.

From south to north (entrance to exit)-Concrete box in good condition. Concrete arch has a few efflorescent covered cracks, but they were dry. Stone block arch section has a few steady drips (mainly in center 1/3 of culvert) and walls were covered with stains and mineral deposits. Two blocks near the center of culvert appear to have lost 2" of their face. Many dry efflorescent covered cracks in short concrete arch headwall section. Keystones at both ends of the stone block arch have slipped down about 2". Overall, the culvert above the water line appeared in generally good condition.



Notes:

Surfaces to which new masonry is to be joined are to be put in such a condition that good bond will be secured.

The Union of carpenters advise as the plates shall be constructed as appropriate only, and may be ordered by the State Engineer to be set any other plates or of any dimensions, dimensions to be given as per paragraph mentioned.

All approved carriers and edges
to be redressed to various widths
All Claws to be 2nd Class.
All memory to be reported where directed
by the Engineer.

Contract No. 62
Erie Canal **Section 10**
 Between west line of Monroe County and Eagle Harbor.
CULVERT AT STA. ~~4588-26.0~~ 4587+55
OLD CULVERT NO. 88

MADE BY W. A. Thompson
 TRACED BY George L. Thompson, July 20
 1st CHECK BY W. O. Starr
 2nd CHECK BY W. A. Thompson, July '08

Examined and approved
Wm. B. Lundy
Special Deputy State Engineer
June 7, 1904

Culvert #87 (Dive) 182' of 30" Cast Iron Pipe
Not Inspected



Exit

Headwall and wingwall ends next to headwall in good condition. Near ends of wingwalls scaled, fractured and delaminated. Culvert empties into swamp.

Culvert #88 (Dive) 221.5' of 48" Cast Iron Pipe
Not Inspected



Exit

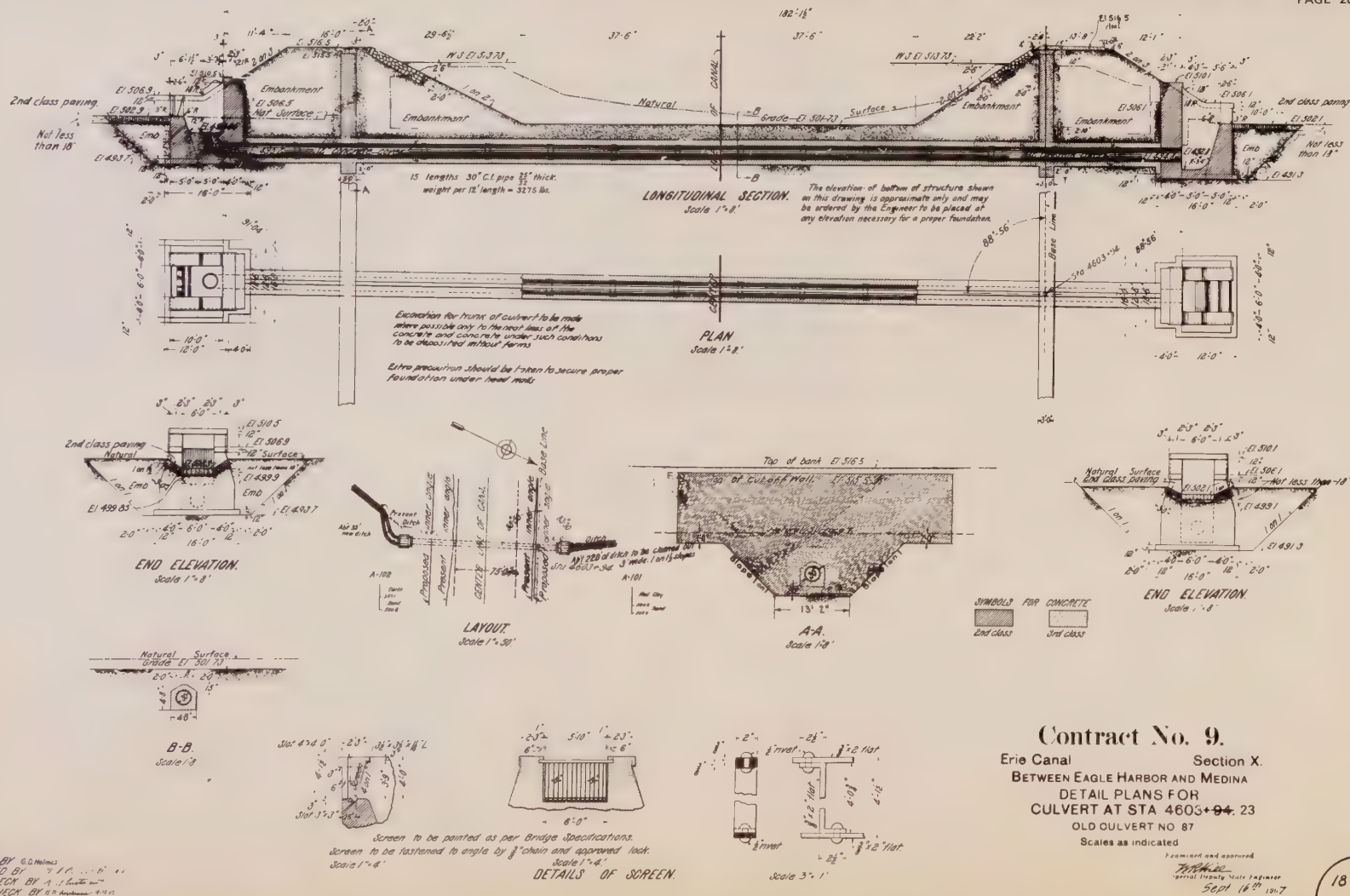
Headwall in fair condition due to many efflorescent covered cracks. 2 horizontal cracks, 1 at top and 1 at bottom of ceiling slab. Culvert well is just inside opening.

Culvert #89 222.5' of 30" Cast Iron Pipe
Not Inspected



Exit

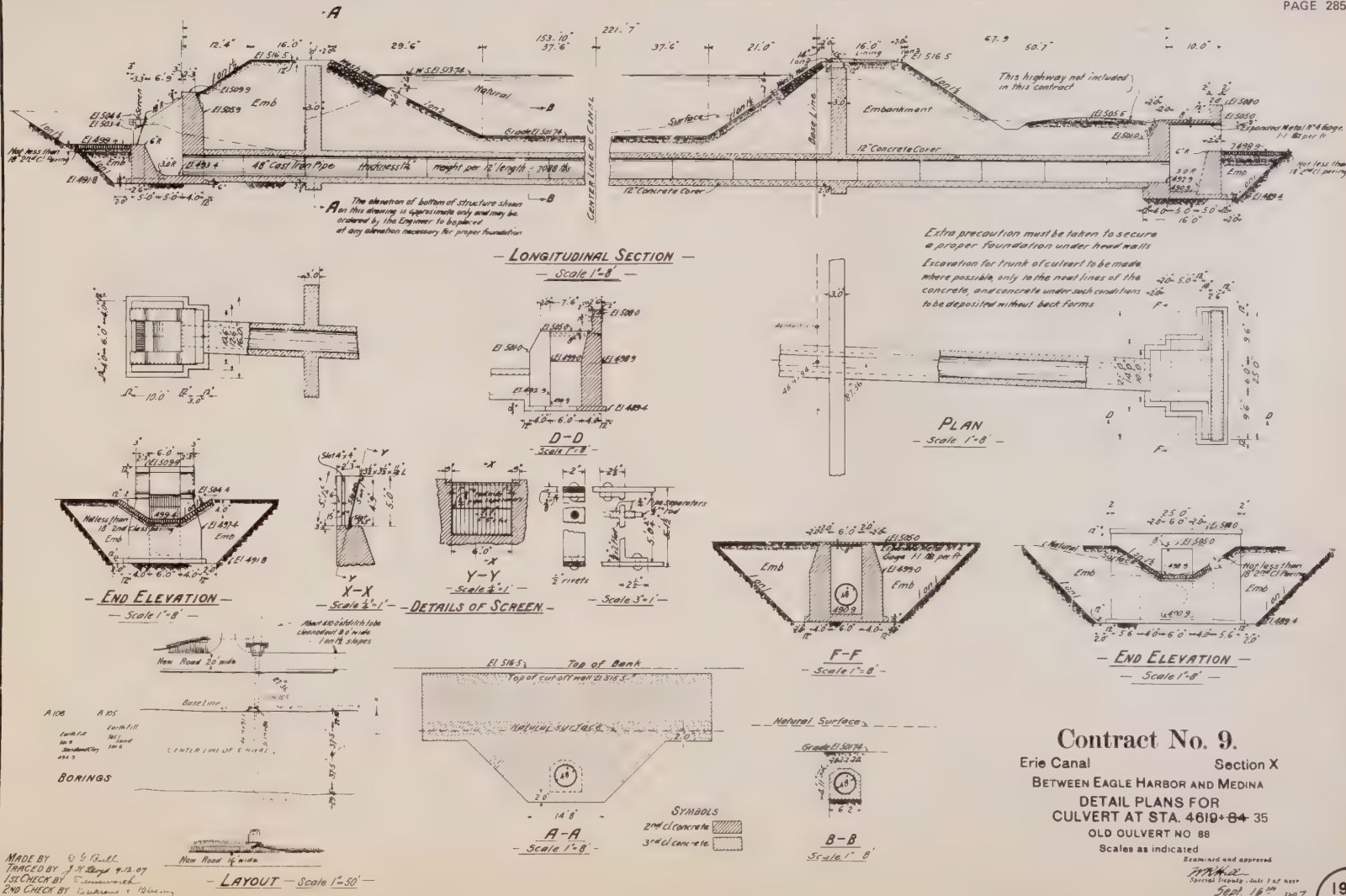
Headwall in good condition. This is not a dive culvert. The drainage channel was filled with vegetation.

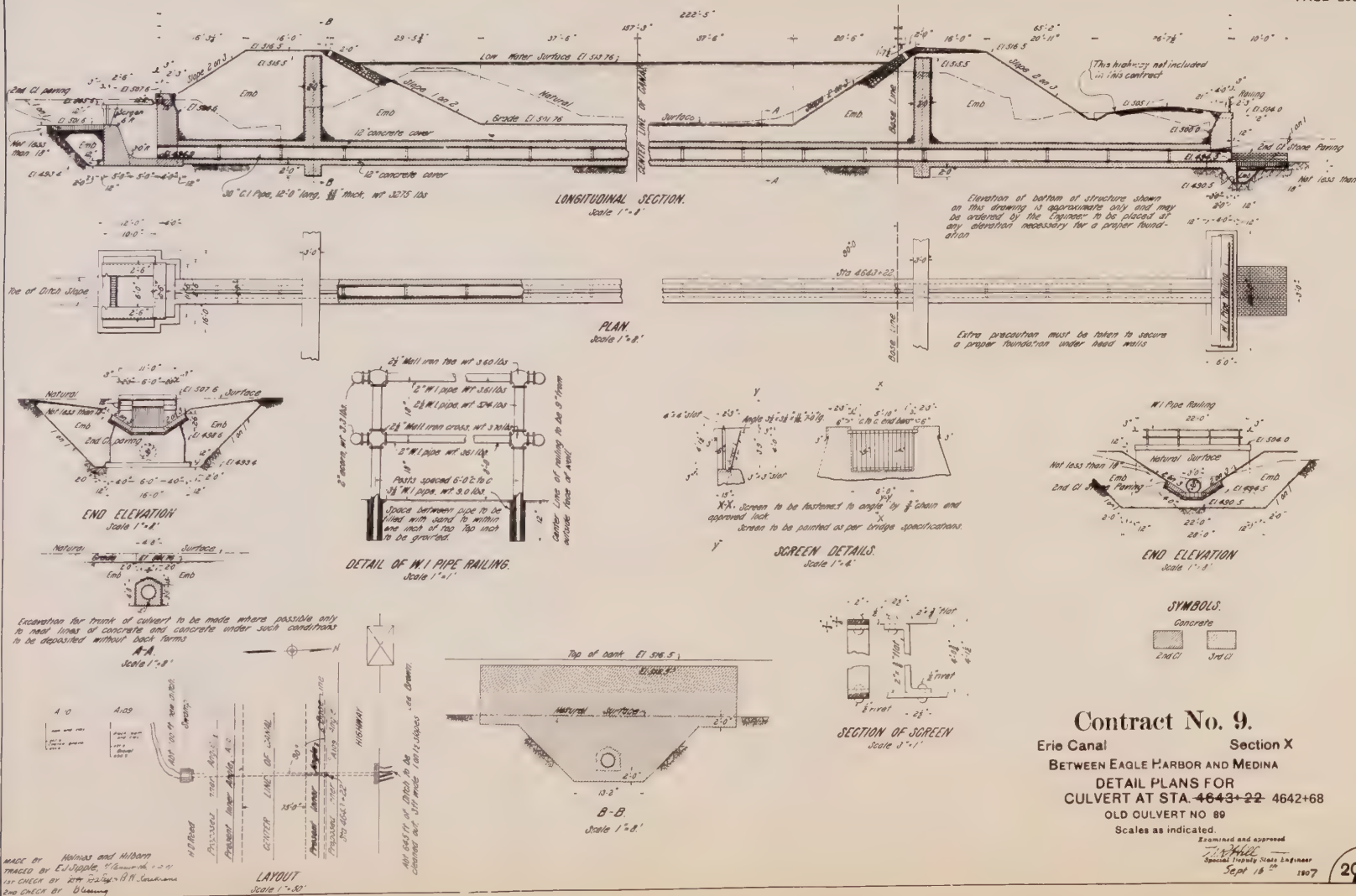


Contract No. 9.

Erie Canal Section X.
BETWEEN EAGLE HARBOR AND MEDINA
DETAIL PLANS FOR
CULVERT AT STA 4603+94.23
OLD CULVERT NO 87

Scales as indicated





Culvert #90 217.5' of 48" Cast Iron Pipe
Not Inspected



Exit

Headwall in good condition except for 1 large vertical crack in the center over the pipe. Culvert was half full of water. A stalagmite curtain wall extended to the water line at the 1st joint. Little or no water flow, 1 active 2" syphon.



Knowlesville Widewater Area - Looking
South

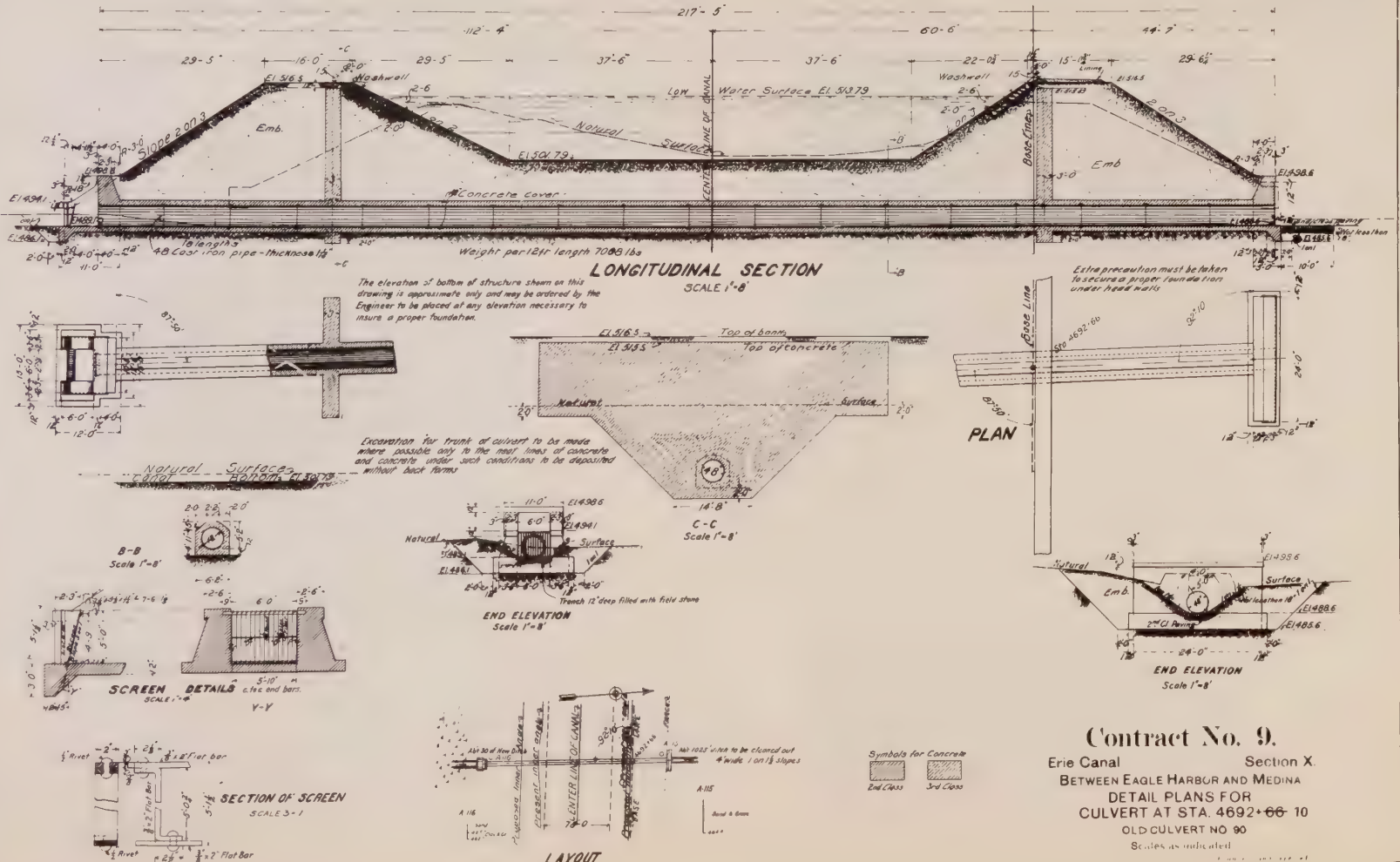
Culvert #90 was plugged prior to flooding the widewater. Old entrance exists under water at left. See Introduction - Canal Culverts

Culvert #91 (Dive) 182.5' of 30" Cast
Iron Pipe
Not Inspected



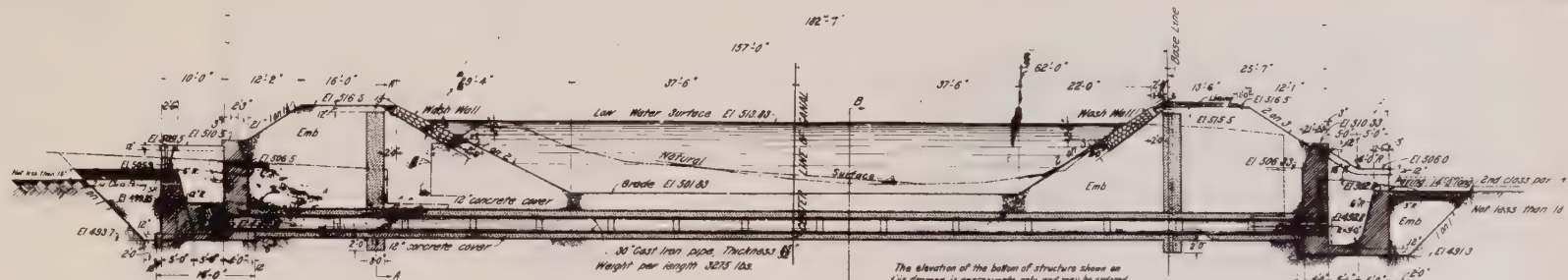
Exit

Upper portion of headwall in good condition. Lower portion near water line had a 6' long, 1' wide by 8" deep horizontal scaled area. Wingwalls in poor condition with many cracks and deep scaling at the water line. Culvert well had been fenced off with railing, possibly to keep cows out.



MADE BY G.D. Holmes
TRACED BY: [illegible]
for CHECK BY: [illegible]
END CHECK BY: [illegible]

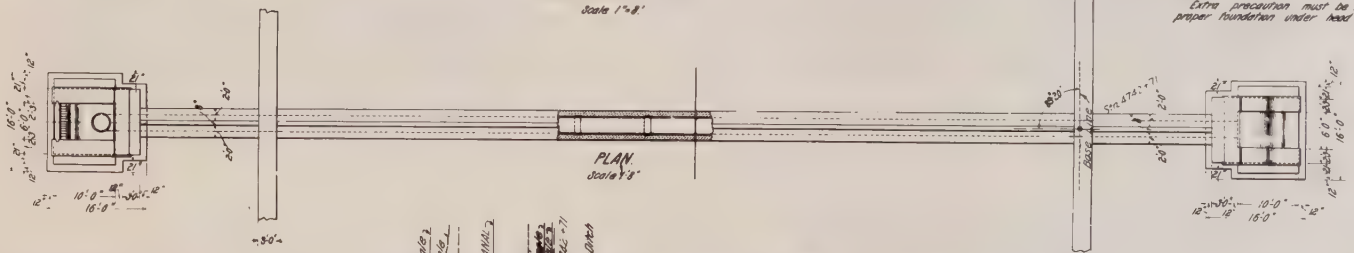
Sept 10 1912



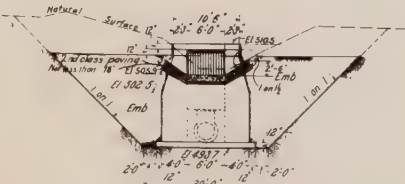
LONGITUDINAL SECTION.
Scale 1"=8'

The elevation of the bottom of structure shown on this drawing is approximate only and may be ordered by the Engineer to be placed at any elevation necessary for a proper foundation.

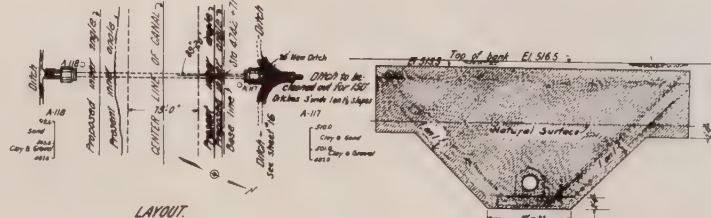
Note - Extra precaution must be taken to secure a proper foundation under head walls.



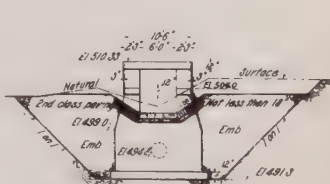
PLAN
Scale 1"=8'



END ELEVATION
Scale 1"=8'

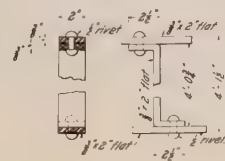


LAYOUT
Scale 1"=8'

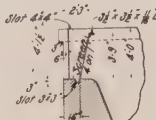


END ELEVATION
Scale 1"=8'

SYMBOLS FOR CONCRETE:
2nd class 1st class

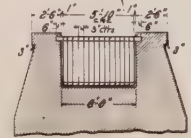


Scale 3"=1'



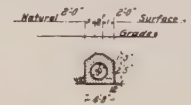
Screen to be fastened to angle by 1/2" chain and approved lock. Screen to be painted as per bridge specification.

DETAILS OF SCREEN.
Scale 1"=4'



Excavation for trunk of culvert to be made where possible only to meet lines of concrete, and concrete under such conditions to be deposited without back forms.

A-A
Scale 1"=8'



B-B
Scale 1"=8'

Contract No. 9.
Erie Canal Section X.
BETWEEN EAGLE HARBOR AND MEDINA
DETAIL PLANS FOR
CULVERT AT STA 4742+71 4741+85
OLD CULVERT NO. 91
Scales as indicated

MADE BY E. Hibben
TRACED BY J. J. Hibben
VAT CHECK BY J. J. Hibben
END CHECK BY J. J. Hibben

Sept 18 1885
J. J. Hibben
J. J. Hibben
J. J. Hibben



Entrance
Sewer creek flows under barn and out through right side of stone wall barn foundation. Someone erected stone walls along the creek, put planks over the top and created a lawn overhead.



Knowlesville-Looking Southeast
Canal lift bridge is at left. Culvert entrance is under barn in background. A manhole entrance should exist by the side of the firehouse on the left according to the original plans, but it was not seen at this time.

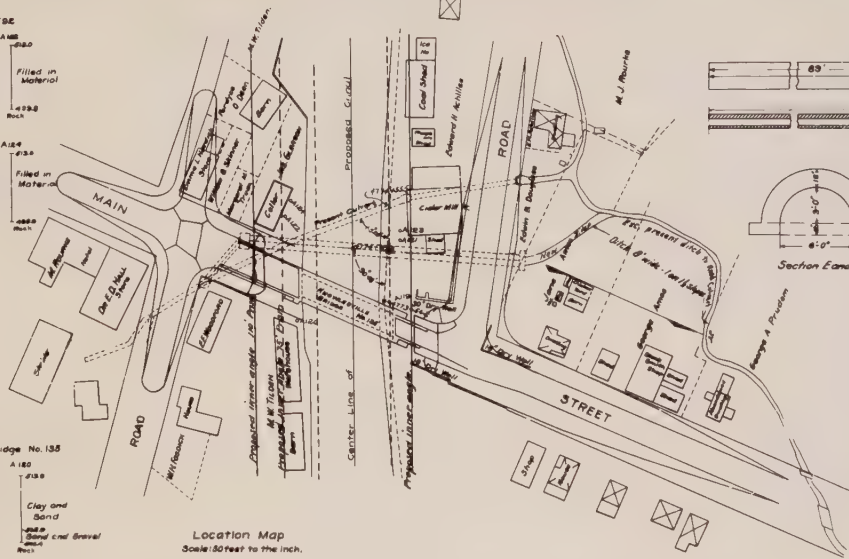
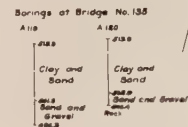
96' of 7.5' Wide x 3'7" High Concrete Arch
191' of Twin 42" Cast Iron Pipe
58' of 6' Wide x 4' High Concrete Arch
150'+ of 4' Wide x 3.5' High Concrete Box
30'+ of 4' Wide x 3.5'+ High Planked over Stone Walls



Exit
Headwall in fair condition. 2 vertical cracks over top of pipe and scattered other cracks. Pipe 2/3rds full of water. Drainage channel filled with debris.



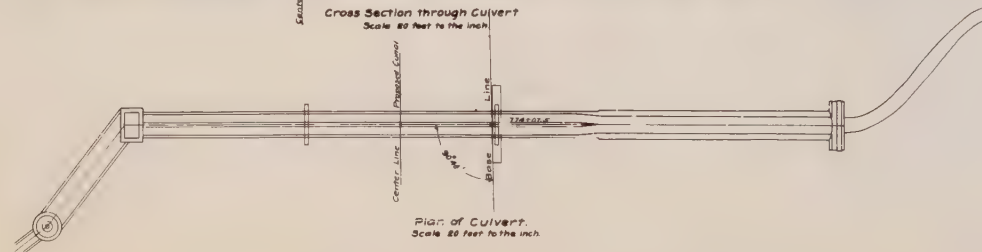
Culvert Exit Area
Headwall is located just beyond road



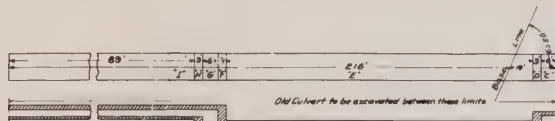
Location Map
Scale 50 feet to the inch.



Cross Section through Culvert
Scale 50 feet to the inch.



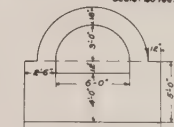
Plan of Culvert
Scale 50 feet to the inch.



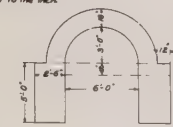
Plan and Cross Section of Old Culvert
Scale 50 feet to the inch.



Section E and I.



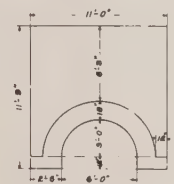
Section B.



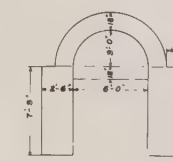
Section C.



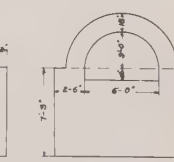
Section D.



Section F.



Section G.



Section H.

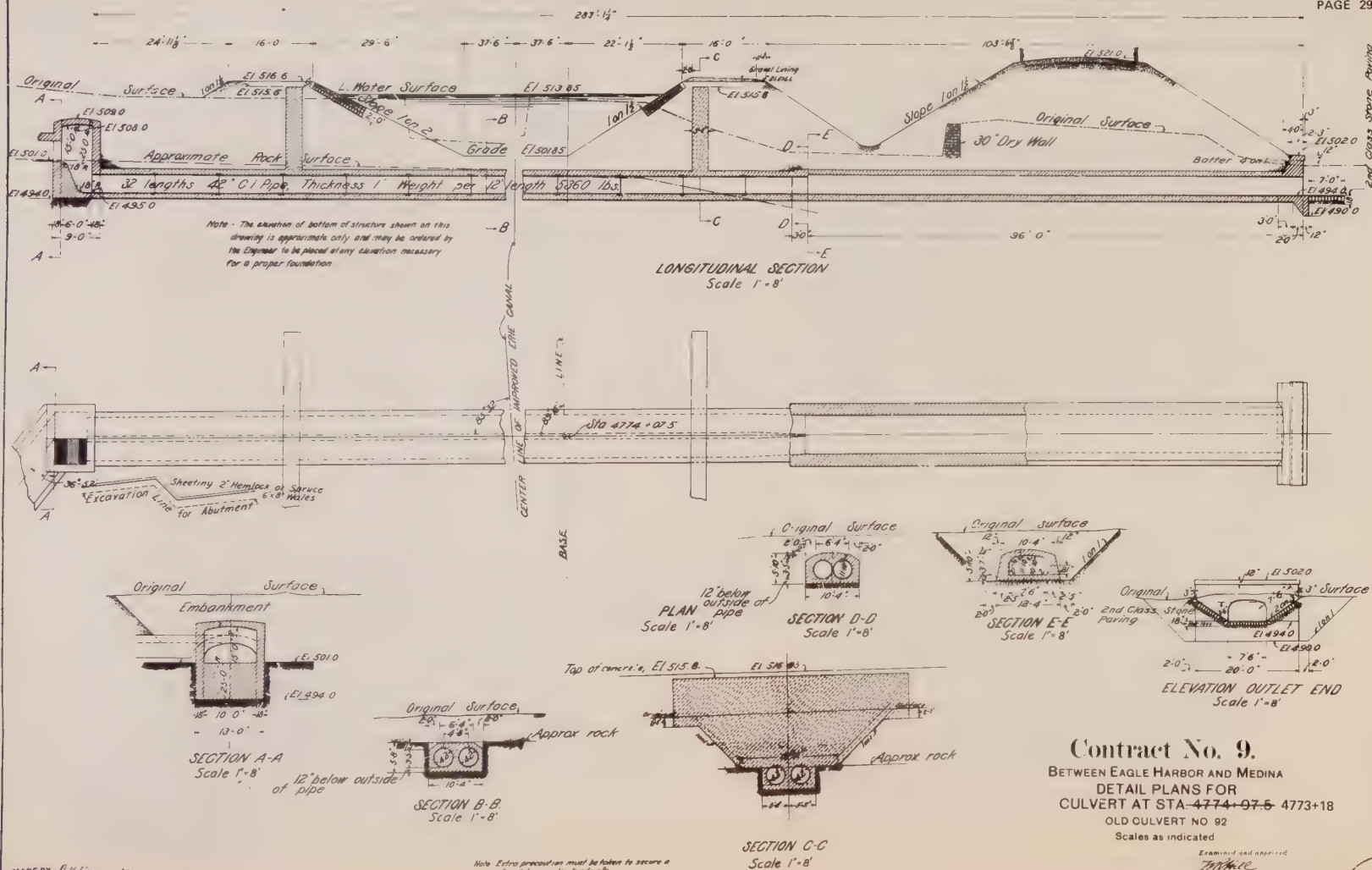
Sections of Old Culvert
Scale 4 feet to the inch.

Contract No. 9.

Erie Canal Section X
BETWEEN EAGLE HARBOR AND MEDINA
LOCATION MAP FOR NEW CULVERT &
DETAILS OF OLD CULVERT
AT STA. 4774+07.5-4773+18
OLD CULVERT NO. 92
Scales as indicated.

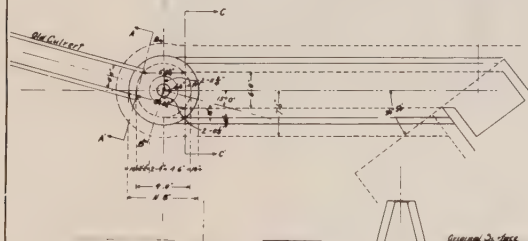
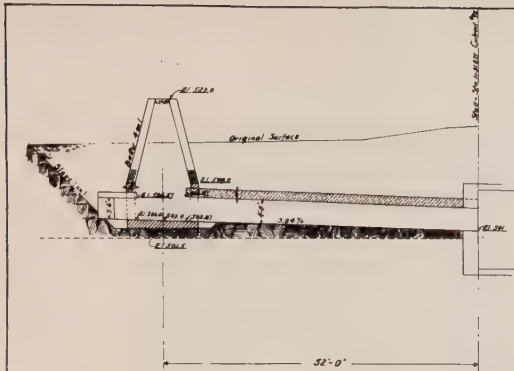
MAILED BY H. C. McVey
DRAWN BY J. H. McVey
1. CHECK BY H. A. Lufkin
2. CHECK BY B. H. Bushman

Examined and approved
Special Inspector
J. H. McVey
J. H. McVey
J. H. McVey

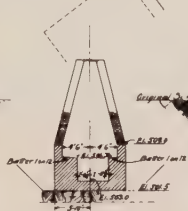


MADE BY B. H. Mc
TRACED BY
1st CHECK BY L. D. Hammond
2nd CHECK BY B. H. Mc

Note Extra precaution must be taken to secure a proper foundation under head walls.

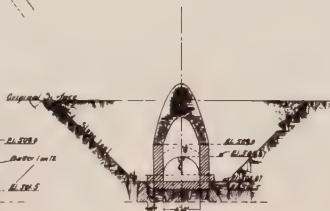


Section A-A



Section B-B

Scale 1'-0"



Section C-C

Section
Scale 1'-1"

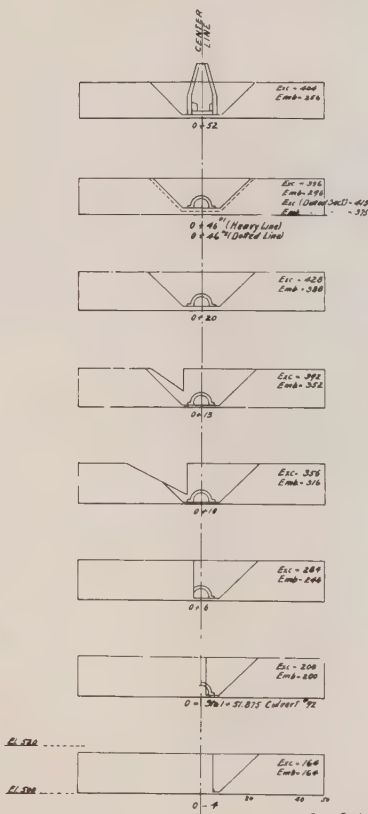
Detail of Manhole Cover and Ring.

Cast Iron



Plan

Estimated Height of Cover - 100 in.
 Ring - 60"
 Total - 160"



Cross Sections of Culvert

Scale 1'-20"

Contract No. 9
 Erie Canal Section X
 BETWEEN EAGLE HARBOR AND MEDINA
 DETAIL PLAN CONNECTING OLD & NEW
 PORTIONS OF CULVERT NO. 92
 AT STA. 4774+07.5 4773+18
 Scales as indicated

Examined and approved
[Signature]
 District Deputy State Engineer
 Sept 18 1910

MADE BY *[Signature]*
 TRACED BY *[Signature]*
 1st. CHECK BY *[Signature]*
 2nd. CHECK BY *[Signature]*

Not Inspected



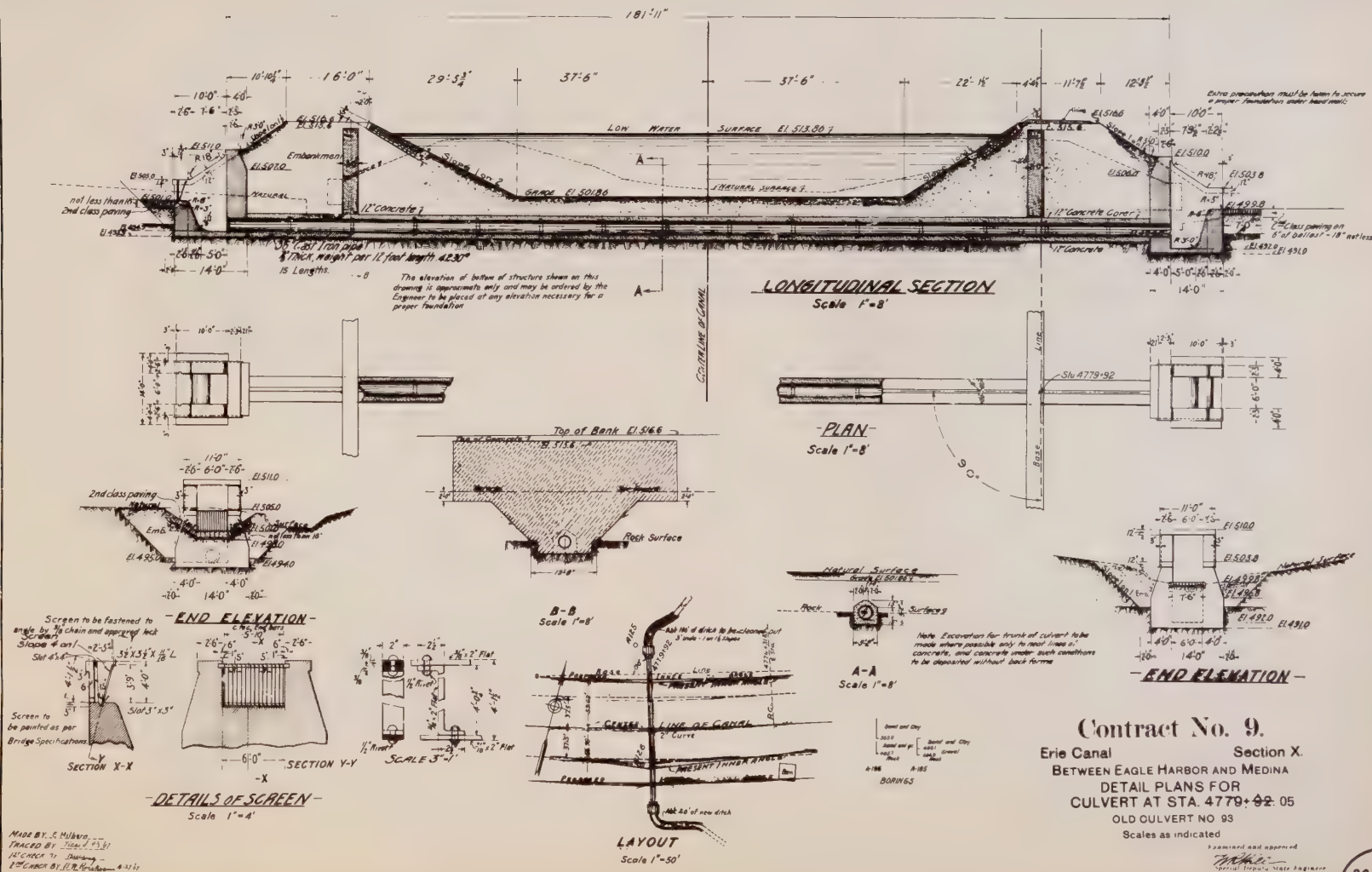
Exit

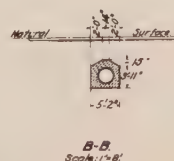
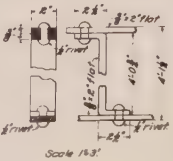
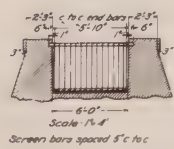
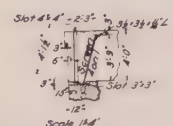
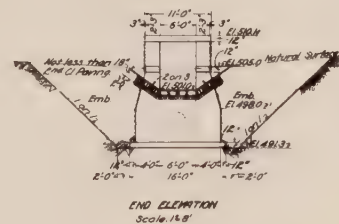
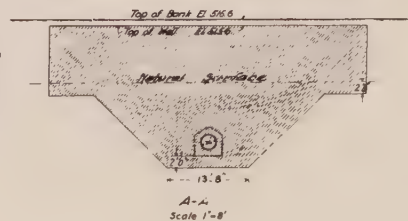
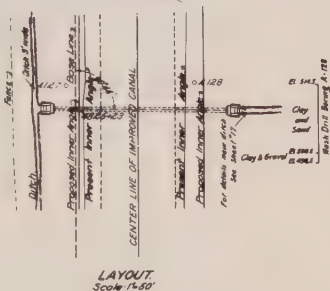
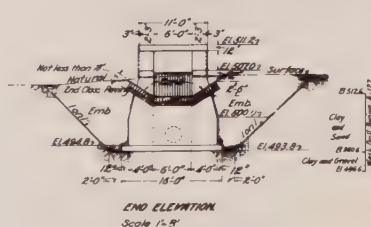
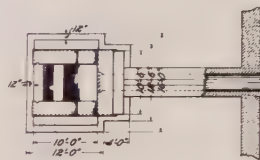
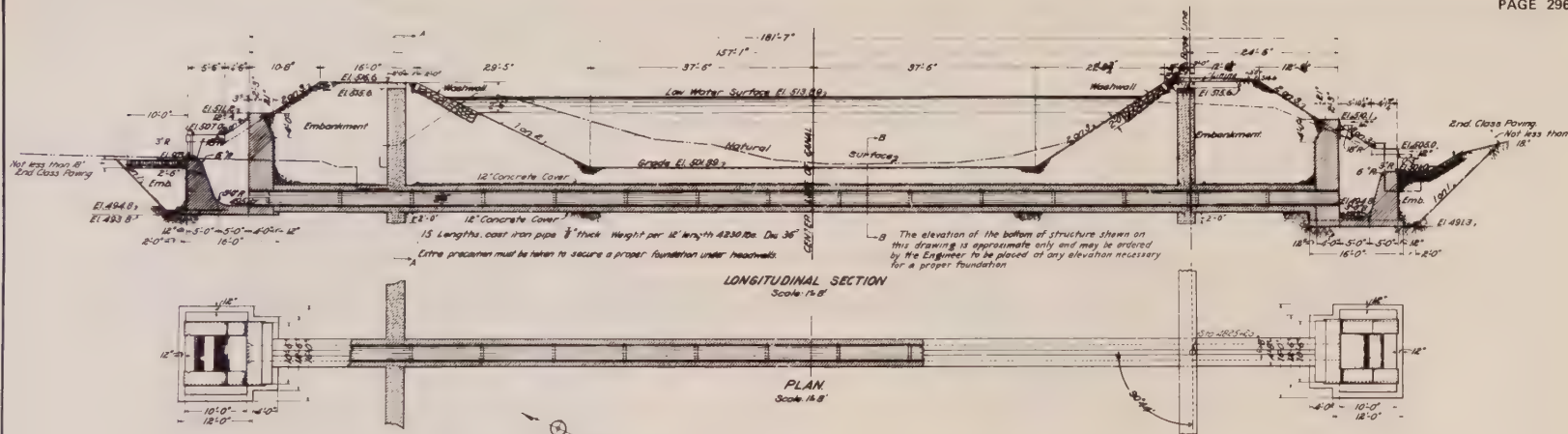
Headwall generally in good condition. A few cracks were just above the water line. Wingwalls had a number of cracks and low ends were a little undermined.



Exit

Headwall in fair condition due to many efflorescent covered cracks. Wingwalls were in poor condition with many cracks. About 1/3 of left wingwall has disappeared.





SYMBOLS FOR CONCRETE

2nd Class 3rd Class

Excavation for trunk of culvert to be made, where possible, only to the neat lines of the concrete, and concrete under such conditions to be deposited without back forms

Contract No. 9.

Erie Canal Section X
BETWEEN EAGLE HARBOR AND MEDINA
DETAIL PLANS FOR
CULVERT AT STA. 4825+~~23~~- 4824+20

OLD CULVERT NO. 94
Scales as indicated

It seems most appropriate

John H. White
Special Agent in Charge
Sep 16th 1917

MADE BY E Hilborn
TRACED BY Dan Wadby
1st CHECK BY 31022179
2nd CHECK BY 1571 Ruchane

Culvert #95 176' of Twin 10'2" Wide X 7' High
Concrete Lined Stone Block Arch and
30' of Concrete Arch



Entrance

Headwall and wingwalls were in fair to poor condition with numerous cracks, deep scaled and delaminated areas.



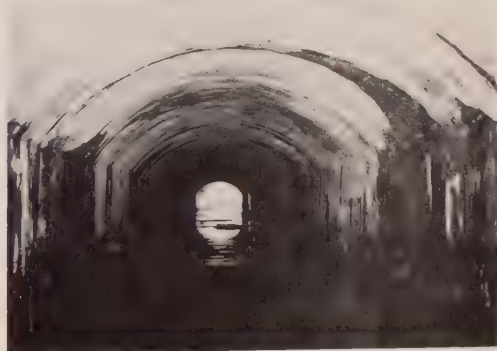
Exit

Headwall and wingwalls were in fair condition with many cracks, scaled and delaminated areas. Culvert floor is bedrock.



West Barrel - Looking North from Entrance

Both barrels contained similar deterioration - the concrete arches at the barrel ends had a number of efflorescent covered cracks. The concrete linings had many deep scale areas ranging in size up to 30 square feet. In 2 of these deep scale areas, the stone blocks behind the lining were exposed. Very little ceiling drainage, but one small stream was coming through the west side of the west barrel. Repairs are needed.



East Barrel - Looking South

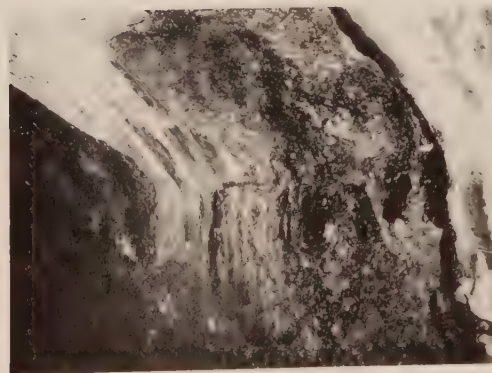


South End of East Barrel

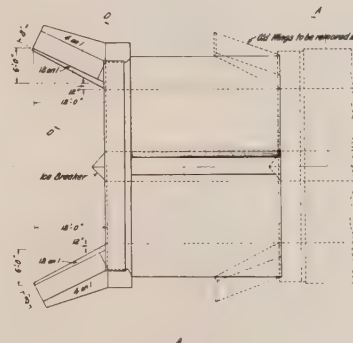
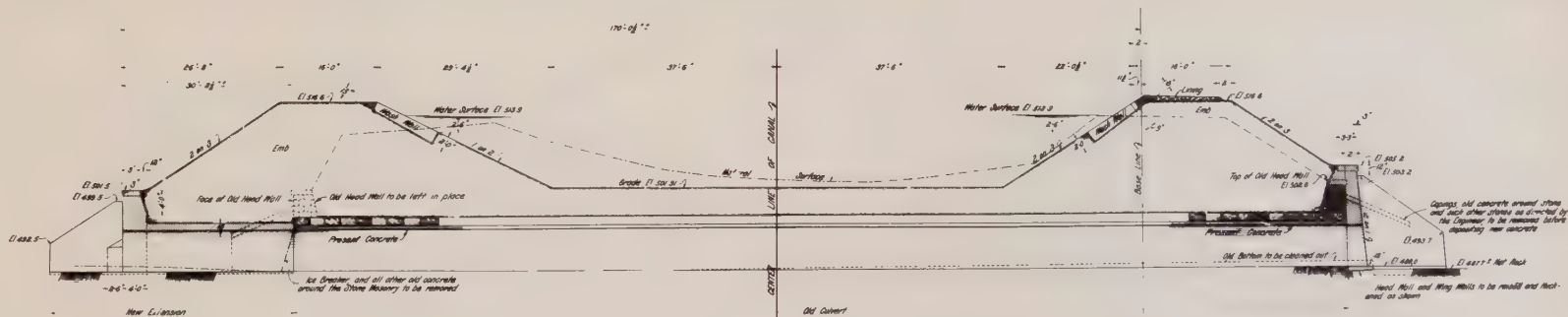
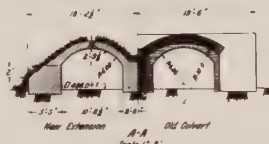


West Barrel - Deep Scaled Areas

Stone blocks can be seen behind the 8" thick concrete lining. Small stream coming through block wall in this area.



West Barrel - Deep Scale Area

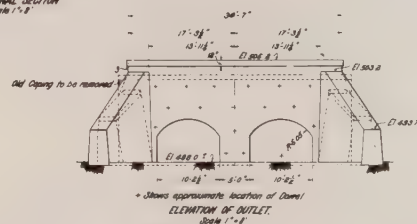
PLAN OF INLET CHD
Scale 1"=8'

NOTES

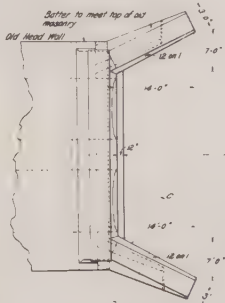
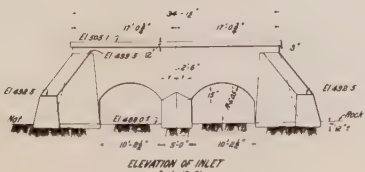
New masonry in the structure shown on this sheet is to be laid of concrete. Careless of the bottoms of the structure shown on this sheet are approximately 18'-0" and may be ordered by the Engineer to be placed at any elevation necessary for a proper foundation.

Exposed edges of completed structures to be rounded to a radius of 1'.

Before discharging new concrete against old masonry, said masonry and other old masonry as is indicated on this sheet are to be removed. The old masonry is to be thoroughly cleaned and resurfaced if directed by the Engineer, to insure a good bond between the old and the new masonry.



Old Culvert to be removed

DETAIL SHOWING METHOD OF
PLACING CONCRETE
Scale 1"=8'PLAN OF OUTLET
Scale 1"=8'ELEVATION OF INLET
Scale 1"=8'O-D
Scale 1"=8'LAYOUT
Scale 1"=50'SEE CHANGES
PAGE 305

Contract No. 9.

ALTERATION NO. 2.

Erie Canal Section X
BETWEEN EAGLE HARBOR AND MEDINA.
REVISED DETAIL PLANS FOR CULVERT
AT STA. 4851+40 4850+58
OLD CULVERT NO. 95
Scale: 8 feet to the inch, except as indicated.

Examined and approved

[Signature]
Resident Company State Engineer
Oct 13 1908

MADE BY J. M. Ireland, Oct 25
TRACED BY J. M. Ireland, Oct 25
101 CHECK BY J. M. Ireland, Oct 25
2nd CHECK BY J. M. Ireland, Oct 25



South End Headwall Aug. 1976
Dark area on lower left wingwall and west wall near south end began leaking seriously in Aug. 1976



North End Headwall

This culvert was first inspected on Oct. 1, 1975. At that time, a number of areas mainly in the south half of the culvert were slowly dripping. The whole inside had been covered with shotcrete and about 25% of the shotcrete was now either missing, loose or delaminated. Although the concrete roadway was cracked, uneven in places and covered by water in some areas, the culvert looked in good condition.

On Nov. 20, 1975, while passing through the culvert, a heavy leak was seen coming through the west wall near the south end and the Region was notified.

This culvert has had a problem with leakage since it was built. In the 1918 Superintendent of Public Works Report, the following information was found: "Knowlesville road culvert has been leaking for some time. Leakage becomes serious during the month of October. Steel sheet piling driven in berme bank east of culvert and 2 boatloads of clay placed on south bank in prism. This cut off leak temporarily. I am informed by the division engineer that the canal prism is to be lined with concrete for a distance of 150', both east and west of culvert centerline."



Leak Through West Wall 30' from South End, Nov. 1975

Culvert 96
Prism Lining - Mar. 31, 1976
Lining placed in 1920 under Contract 200



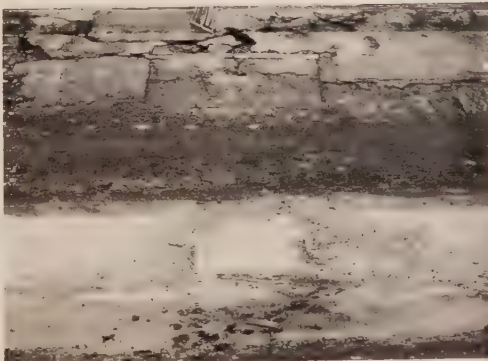
Looking West - Prism Lining Over Culvert



Looking West - Prism Lining Over Culvert



Looking East - Prism Lining over Culvert



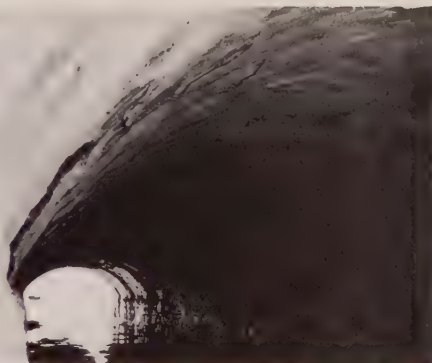
Looking South Directly Over Culvert
3-4" of concrete missing over center
of Culvert.
Note holes at top of south embankment.



Looking North Near Center of Culvert
Leaks are from nearly dry canal.



East Edge of Waterproofed Concrete Slab
Most of the 4" thick concrete top slab has dis-
appeared here.



Looking South From North End
Heavy leaks developed along base of west wall about 50-100' in from entrance and at west wingwall.
Note loose shotcrete lining.



Looking West Along South Embankment From Culvert Centerline
In late Aug. 1976, the south embankment was lined with clay for approximately 75' on either side of the culvert in an attempt to stop leaks.



After the south embankment was lined with clay, 2 small whirlpools were seen near the water edge over the culvert. These were plugged by hand.

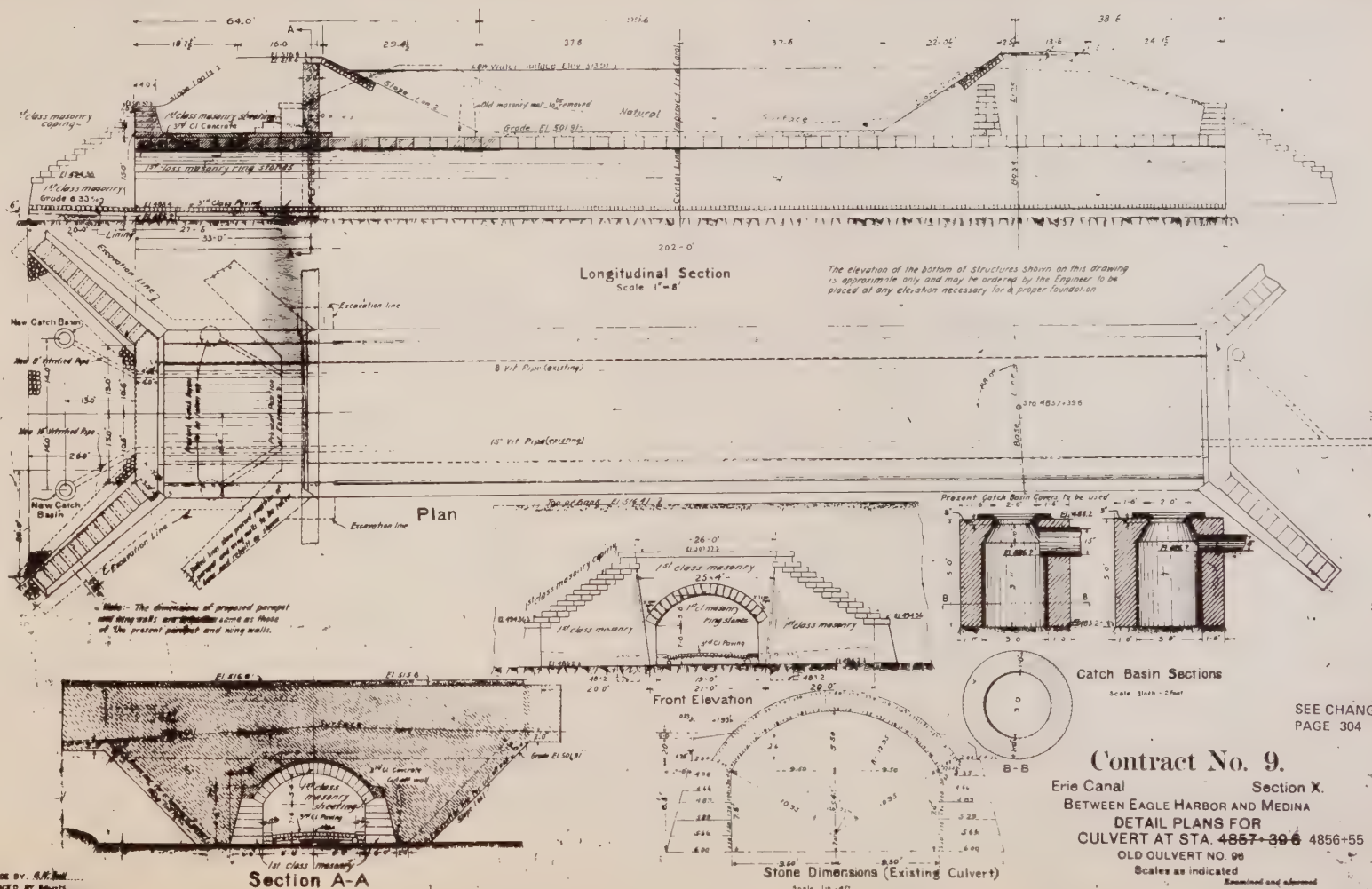
After the clay lining was placed, the rate of leakage had been cut by approximately 1/3. In the mean time, the decision was made to remove the old prism lining and replace it with a continuous waterproofing membrane. This work is to be done in the Spring of 1977 under Contract D95315.



Looking East, March 1977 - Arrows Denote Holes
Most of the clay was on the canal bottom.



Leak Hole Found About 20' West of Fence
Clay only partially plugged hole.



MADE BY: R.H. Hall
TRACED BY: R.H. Hall
P. CHECK BY: R.H. Hall
C. CHECK BY: R.H. Hall

Examined and approved

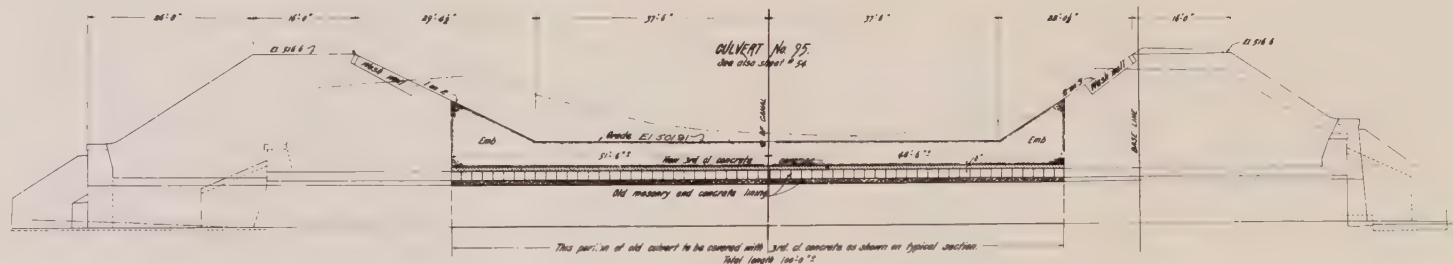
R.H. Hall

R.H. Hall

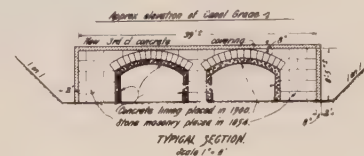
R.H. Hall

R.H. Hall

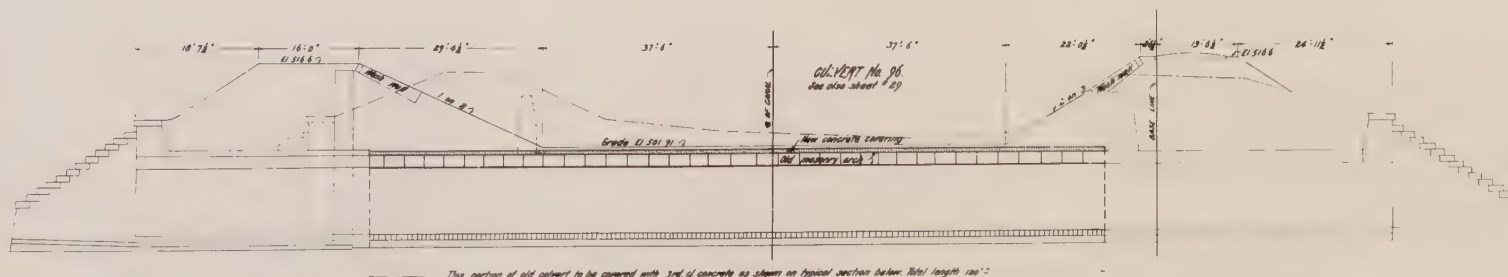
R.H. Hall



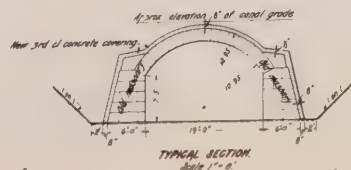
LONGITUDINAL SECTION
Scale 1" = 8'



TYPICAL SECTION
Scale 1" = 8'



LONGITUDINAL SECTION
Scale 1" = 8'



TYPICAL SECTION
Scale 1" = 8'

NOTES

The concrete covering shall be placed over only such parts of the old masonry as the Engineer shall deem necessary for securing proper reinforcement and protection against bulging, and the excavation for same shall be made only to the depth necessary for placing of concrete, or for the proper inspection of the old work. Before depositing new concrete against old masonry all loose fragments of stone and mortar shall be removed and the old masonry thoroughly cleaned and wetted to insure a good bond between the old and new work. Where the excavation leaves the core walls exposed or is any danger of overturning or buckling, the walls shall be properly braced by timber bracing the same to be paid for at the contract price for shoring and bracing.

SEE CHANGES
PAGE 305

Contract No. 9.

ALTERATION NO. 8

Erie Canal Section X

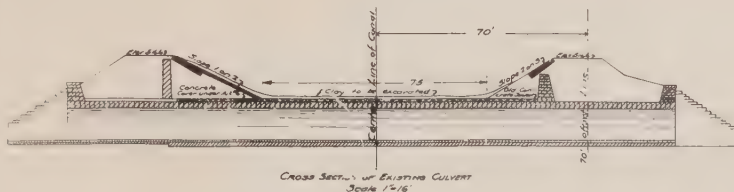
SECTIONS OF CULVERTS, STAS. ~~4856+40~~
4850+58 & ~~4857+39.5~~ SHOWING CONCRETE
COVERING TO BE LAID
4856+55 OLD CULVERT NOS. 95 & 96

Scale: 8 feet to the inch

Examined and approved
1/10/17
Special Deputy State Engineer
R. E. G. 1009

MADE BY: J. J. Schuchman
TRACED BY: J. J. Schuchman
151 ORDER BY: M. C. H. H.
2nd CHECK BY: J. J. Schuchman

58

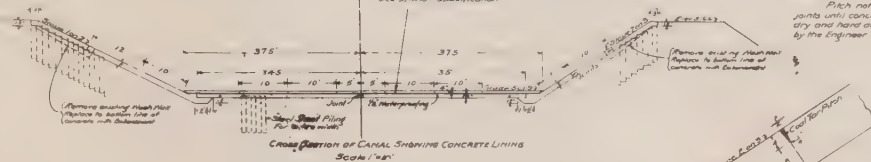


All concrete to be Second Class

Waterproofing shall consist of 3 thicknesses single ply, cool tar felt, laid with built joints, different layers breaking joints about 6". Six mappings of hot pitch shall be applied, one to the top surface of lower layer of concrete, and one to each layer of felt immediately before the next layer is placed.

See specs specification

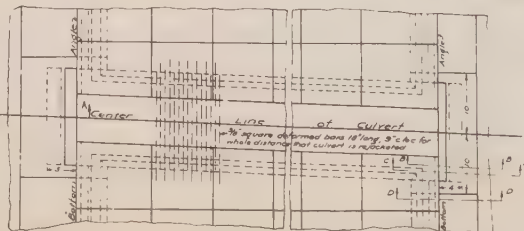
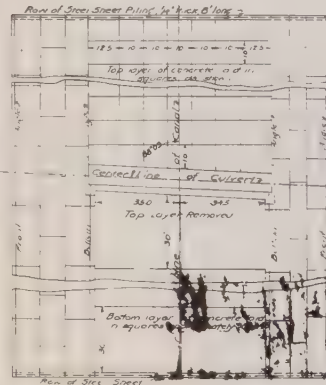
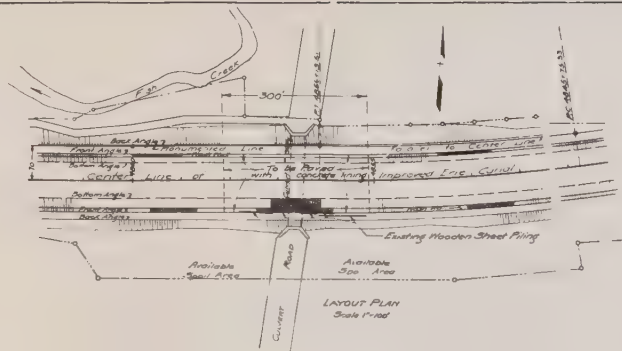
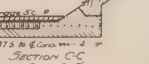
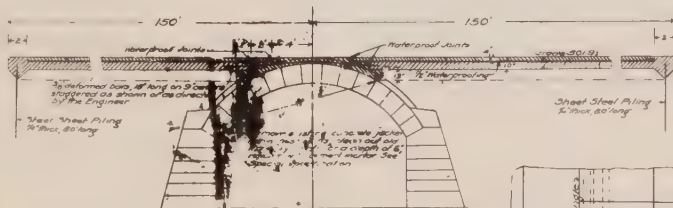
Note - Pitch not to be poured in joints until concrete is thoroughly dry and hard and until ordered by the Engineer



Note - Pitch not to be poured in joints until concrete is thoroughly dry and hard and until ordered by the Engineer



Note - All joints on slopes to be waterproofed as shown above



Contract No. 200
Erie Canal **Sections 9 & 10**
Driving piling etc., between Rochester and Lockport
PLAN & DETAILS OF CONCRETE LINING
AT CULVERT NO. 96, TWO AND ONE-HALF
MILES EAST OF MEDINA
Scales as indicated

Examined and approved
... Deane ... 1918
... J. H. Mills ...
Division Engineer

Culvert #97 (Dive) 181.5' of Twin 36" Cast Iron Pipe
Not Inspected



Exit

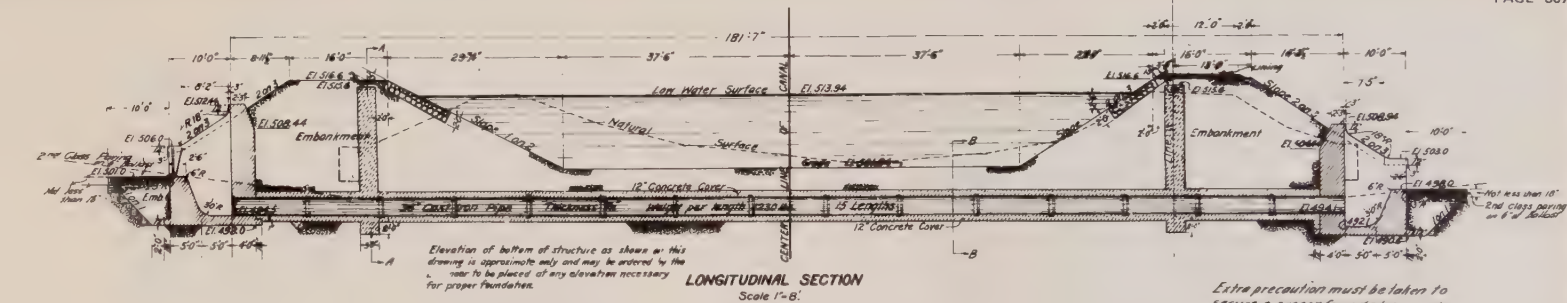
Headwall and most of wingwalls in good condition.
Low ends of both wingwalls were undermined and
appeared ready to fall off. 2-3" syphons, 1 active.

Culvert #98 (Dive) 221.5' of 48" Cast Iron Pipe
Not Inspected

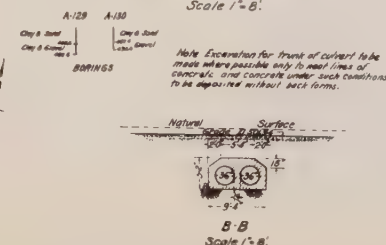
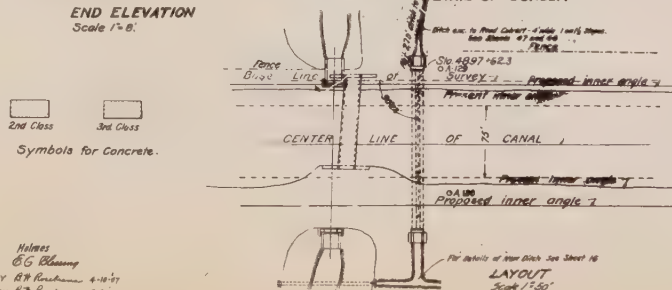
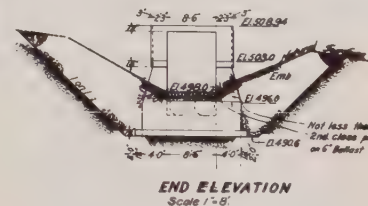
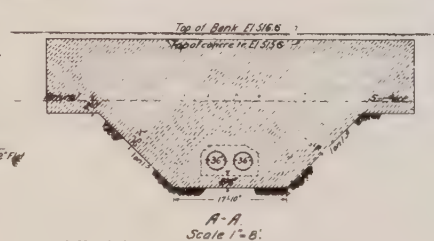
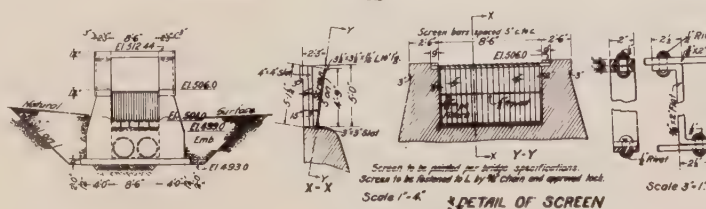
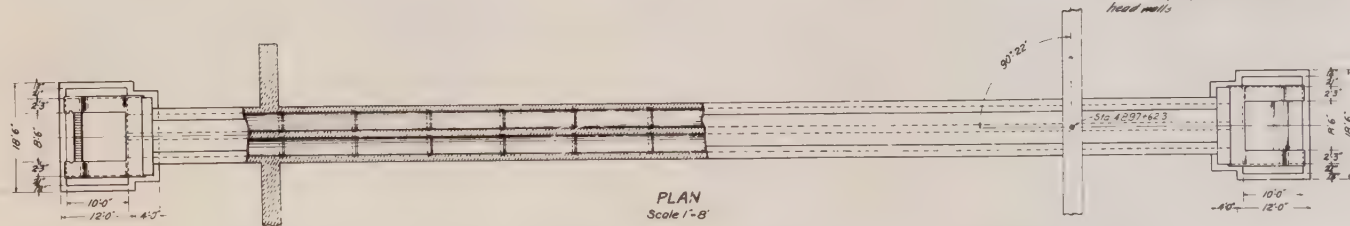


Exit

Headwall and wingwalls in fair to poor condition
with many cracks, scaled and delaminated areas. Very
deep culvert well.



Extra precaution must be taken to secure a proper foundation under head matts



Contract No. 9.
Erie Canal **Section X.**
BETWEEN EAGLE HARBOR AND MEDINA
DETAIL PLANS FOR
CULVERT AT STA. ~~4897+62.9~~ 4896+75
OLD CULVERT NO 97
Scales as indicated

MADE BY Holmes
TRACED BY EG Blossing
1ST. CHECK BY R# Rosecrance 4-10-07
2ND CHECK BY L# Rosecrance 5-2-07

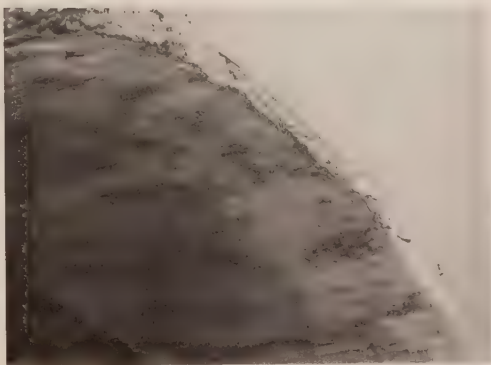
Examined and approved
W. H. Hill
 Special Deputy State Engineer
 - Sept 16 1917



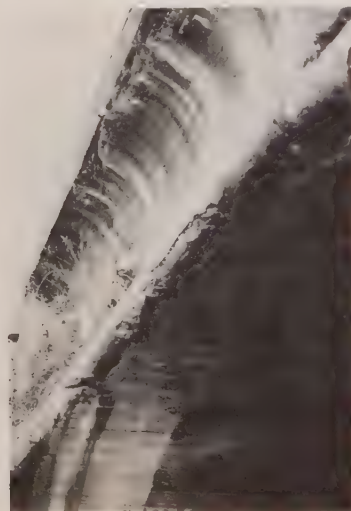
Entrance
Wall surface has partially scaled away



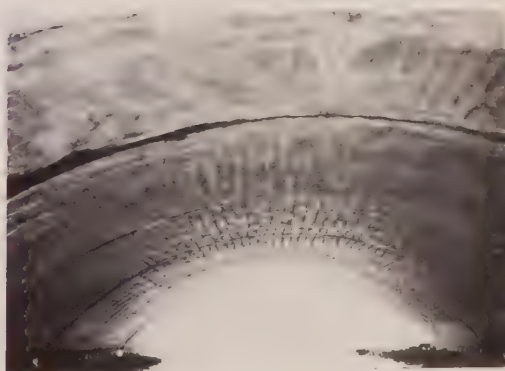
Exit
Canal towpath on top of wall. Note cracks and vegetation.



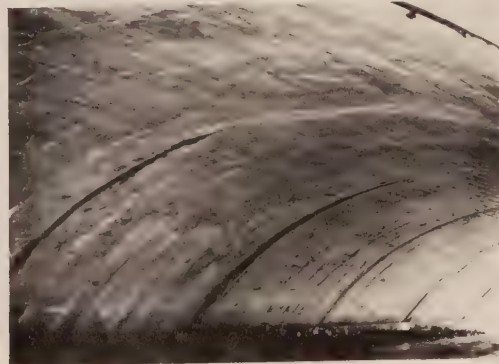
Edge of Arch Entrance
Note exposed steel bars and efflorescent covered cracks.



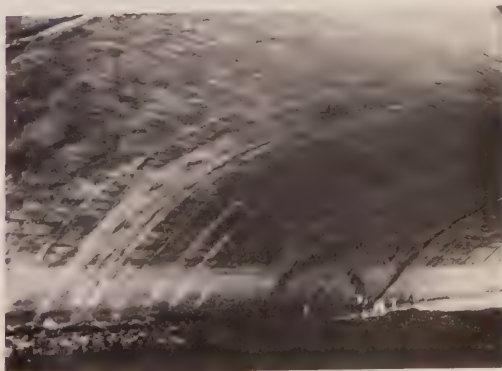
Edge of Arch Exit
Note scaling and efflorescent covered cracks.



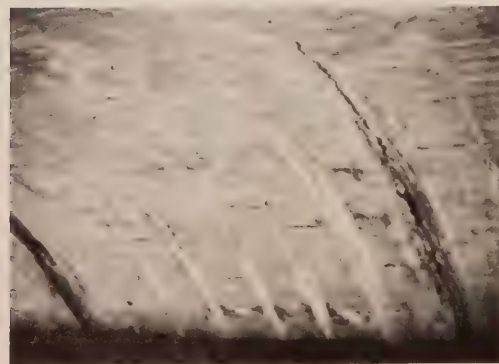
Looking North from Entrance



West Side of Arch



East Side of Arch
Note vertical efflorescent covered cracks at
3-4' spacing on lower section of arch wall.



West Side of Arch
3-4' spacing of efflorescent covered cracks

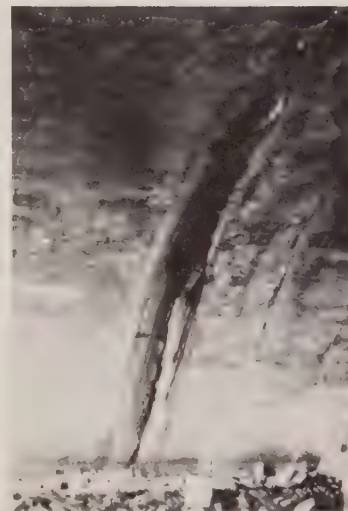


East Wall - 1st Joint from Entrance

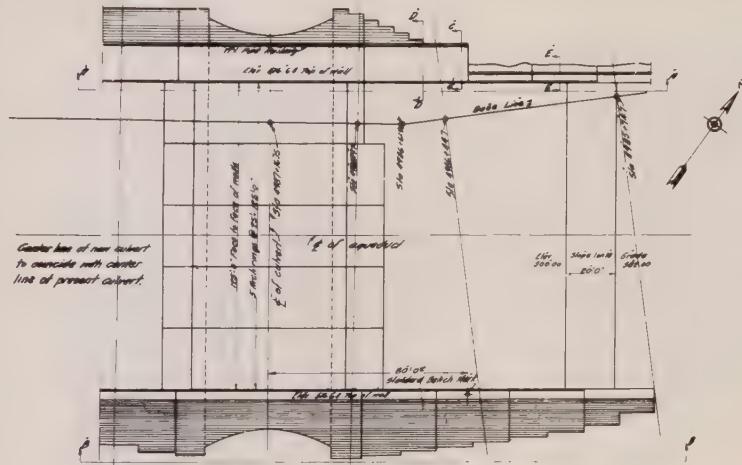


Retaining Wall on East Side Next to Entrance
Bottom of wall undermined. Large depression
behind left end of wall.

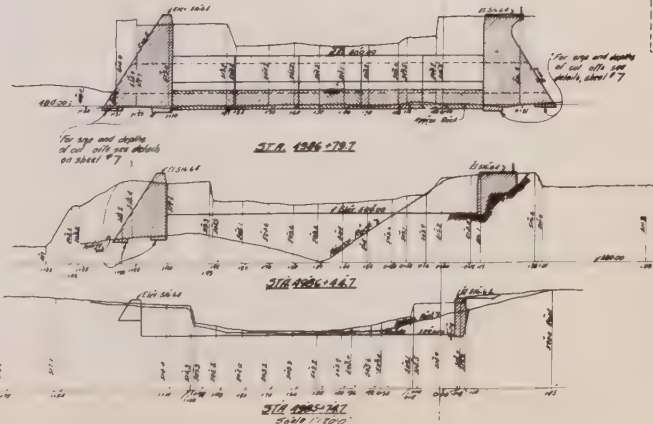
From south to north (entrance to exit) - 6 construction joints exist in the arch barrel. The 1st joint was 50% scaled to a depth of 6" mainly on the south side of the joint. There was no leakage, but it was damp on both sides. The 2nd joint was 5% scaled and in good condition. There were no leaks, but it was coated with efflorescence. The 3rd joint was 20% scaled to a depth of 3". There was no leakage. The 4th joint had scaled 4" deep along 30% of the joint length. No obvious leaking. No scaling or leakage at joint 5. There was, however, some efflorescence and joint was damp on west half of barrel. Joint 6 was scaled approximately 8" deep along 50% of the joint. The east end of the joint has one scaled area 8" wide by 1' deep by 3' long. Dripping seen along entire length of joint. On both sides of the arch, there were efflorescent covered cracks spaced 3-4' apart only on the interior arch sections, not on the entrance and exit arch trough wall sections. These cracks line up with the steel arch ribs encased in concrete. Some repairs are needed on this large culvert.



East Wall - 1st Joint From Exit



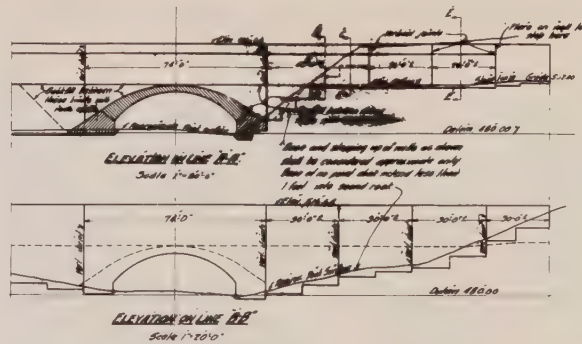
PLAN OF AQUEDUCT
Scale 1"=50'



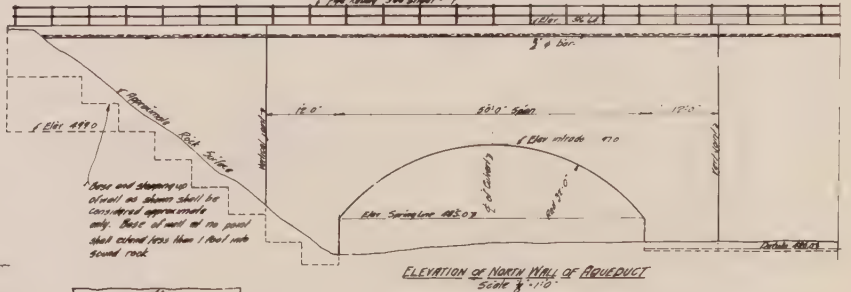
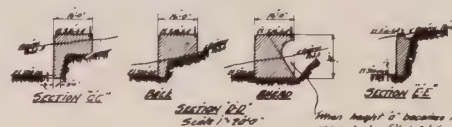
STA. 480+00

STA. 480+46.7

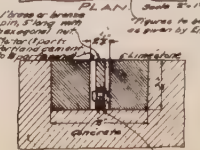
STA. 480+50



ELEVATION OF NORTH WALL OF AQUEDUCT
Scale 1/8"=1'-0"



ELEVATION OF NORTH WALL OF AQUEDUCT
Scale 1/8"=1'-0"



SECTION N-N

CULVERT NO. 99

Contract No. 65.

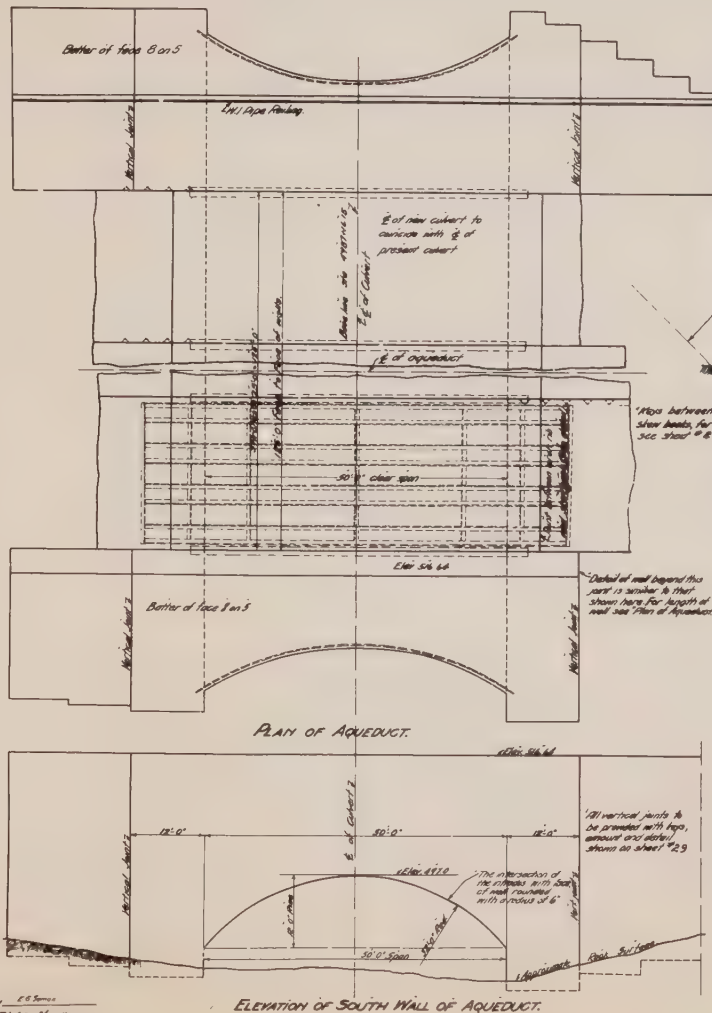
Erie Canal AT MEDINA Section 10

PLAN, ELEVATIONS & CROSS SECTIONS
FOR AQUEDUCT AT STA. 4987 +6.15

FOR OTHER DETAILS SEE SHEETS 35 & 36
Scales as indicated

Designed and approved
Checked by
Reviewed by
Examined and approved
Special Deputy State Engineer

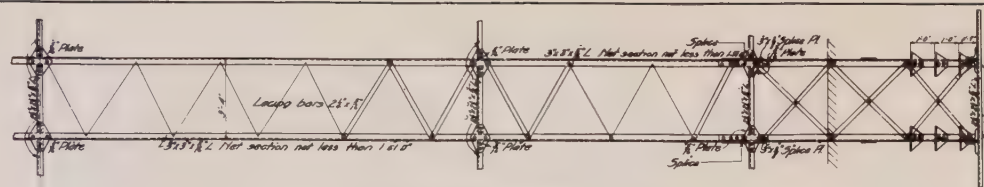
MADE BY
DRAWN BY
CHECKED BY
3rd CHECK BY



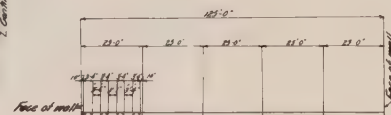
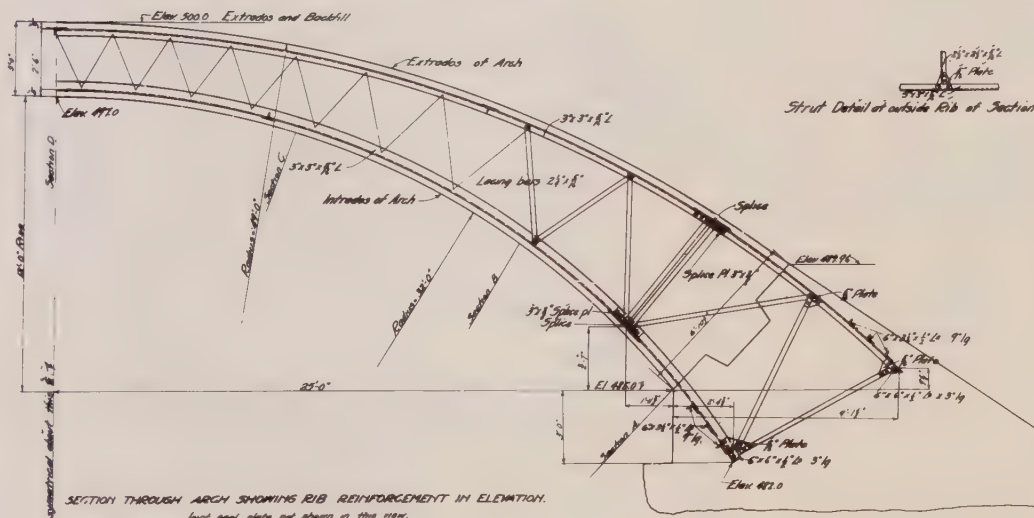
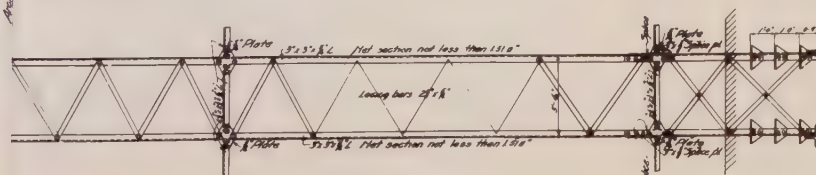
MADE BY E. C. Soren
 TRACED BY E. C. Soren
 IN CHECK BY E. C. Soren
 2nd CHECK BY E. C. Soren

Reviewed and approved
 W. H. S. Soren
 Consulting Engineer

Reviewed and approved
 A. E. Soren
 Special Deputy State Engineer



TOP VIEW OF ARCH RIB REINFORCEMENT (Developed)

Section through Crown showing Ribs
Scale 1" = 20'SECTION THROUGH ARCH SHOWING RIB REINFORCEMENT IN ELEVATION.
Joint near plate not shown in this view.

BOTTOM VIEW OF ARCH RIB REINFORCEMENT (Developed)

Percentages of Reinforcement

| | |
|-----------|-----|
| Section A | 115 |
| - B | 162 |
| - C | 986 |
| - D | 566 |

All rivets 5" diam.
All holes 8" diam.
1" steel Arch Rib shown
4 Ribs required for each section
5 sections required
All material medium open-hearth steel
unless otherwise noted.
Scale 1" = 1' unless otherwise noted
Steel Ribs etc. (all embedded steel)
not to be painted.

CULVERT NO. 99

Contract No. 65.

Erie Canal Section 10

AT MEDINA

DETAILS OF AQUEDUCT AT
STA. 4987+16.15

FOR OTHER DETAILS SEE SHEETS 34 & 35

Scales as indicated

Examined and approved

W. H. H. H.
Hydraulic Engineer

W. H. H. H.
Approved Deputy State Engineer

Culvert #99½ 500'+ of Stone Block Arch
Not Inspected

Storm sewer built by Town of Medina.
Manhole entrances on both sides of canal.

See Introduction - Canal Culverts
It is not known if any plans for this old culvert still
exist.



Entrance Manhole



Exit Manhole in Glenwood Avenue

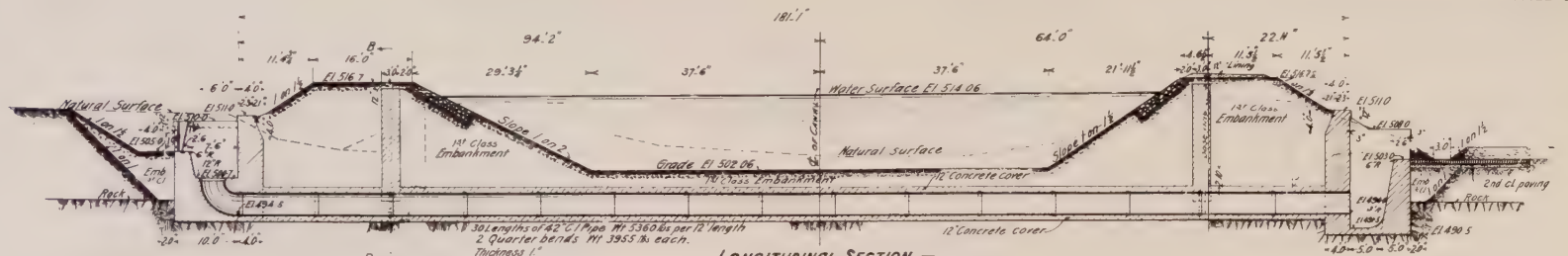
Culvert #100 (Dive) 185' of Twin 42" Cast Iron Pipe
Not Inspected

PAGE 315



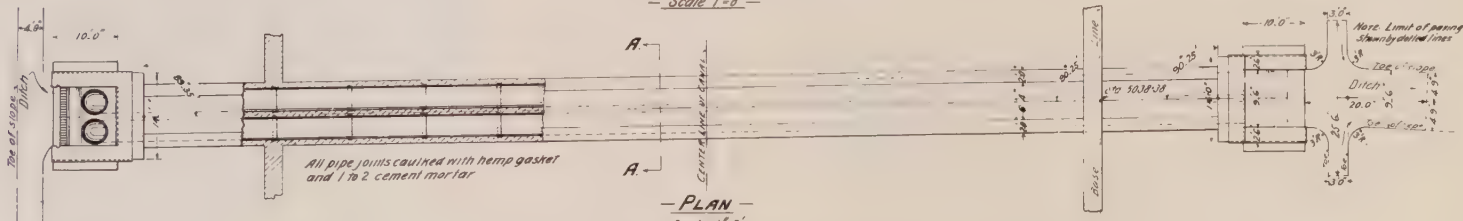
Exit

Headwall in fair condition with many efflorescent
covered cracks on bottom half. Left wingwall in
poor condition with many efflorescent covered
cracks and end scaled up to 6 inches deep. Right
wingwall in fair condition with many efflorescent
covered cracks on bottom half only and end scaled
up to 4 inches deep.



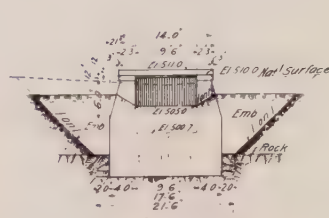
LONGITUDINAL SECTION

— Scale 1" = 8' —



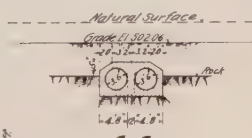
- PLAN -

— Scale 1"=8' —

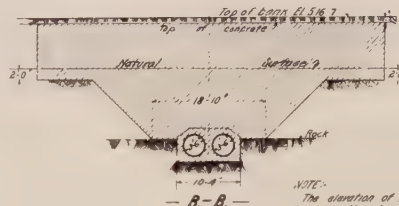


— END ELEVATION —

Scale 1" = 8'

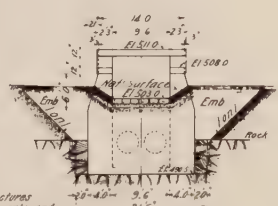


— A-A. —


$$\frac{D. - D.}{1^{\circ} 8'}$$

NOTE:

The elevation of the bottom of structures shown on this drawing is approximate only and may be ordered by the Engineer to be placed at any elevation necessary for a proper foundation.



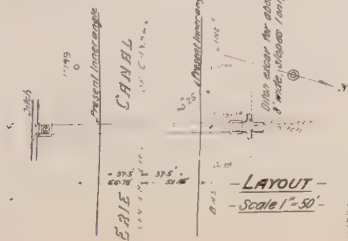
216°

END ELEVATION

Symbols

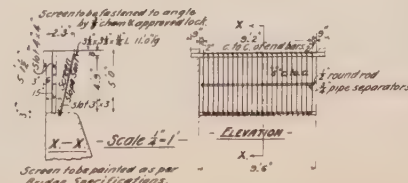
2nd Class Concrete

3rd class concept:



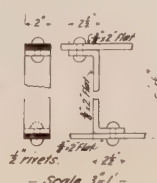
- LAYOUT

— Scale 1" = 50'



- Scale 2 = 1

Screen to be painted as per
Bridge Specifications.



—DETAILS OF SCREEN—

Scale 3"=1'

Contract No. 64.

Erie Canal Section 10.

Between Medina and Gasport

DETAIL PLANS FOR CULVERT
AT STA. 5028+28.12

AT STA. 5038+35-18
OLD CULVERT NO. 100

Scales as indicated

Благодаря

Examined and approved
[Signature]

Special Deputy State Engineer

February 5th 190

MADE BY Sullivan J. H. Lloyd
TRACED BY J. J. H. Lloyd 77-07
1ST CHECK BY J. J. H. Lloyd 7/24/77
2ND CHECK BY J. J. H. Lloyd

(29

Culvert #101 204.5' of Twin 42" Cast Iron Pipe
Not Inspected



Exit

Concrete in headwall appeared to be in good condition, but the headwall was tilted. Half full of sewer water. Pipes appeared to be clean. 2-3" active syphons.



Headwall Tilted

A 2' diameter tree stump was seen at each end of the headwall. The trees apparently caused the headwall to tilt about 1' at the top.

Culvert #102 196' of 36" Cast Iron Pipe
Not Inspected

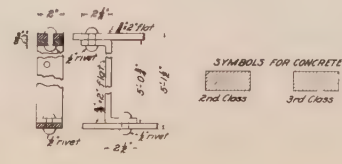
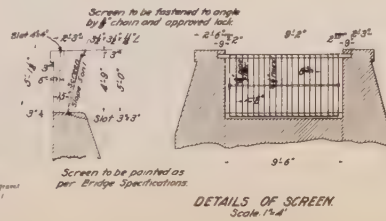
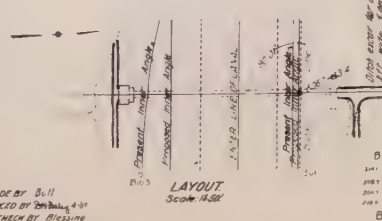
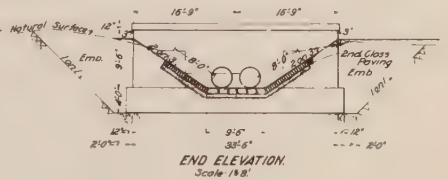
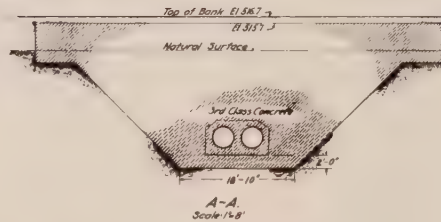
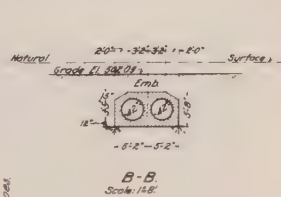
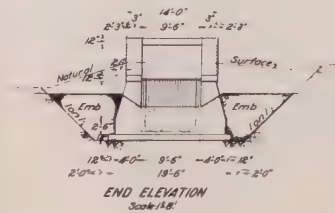
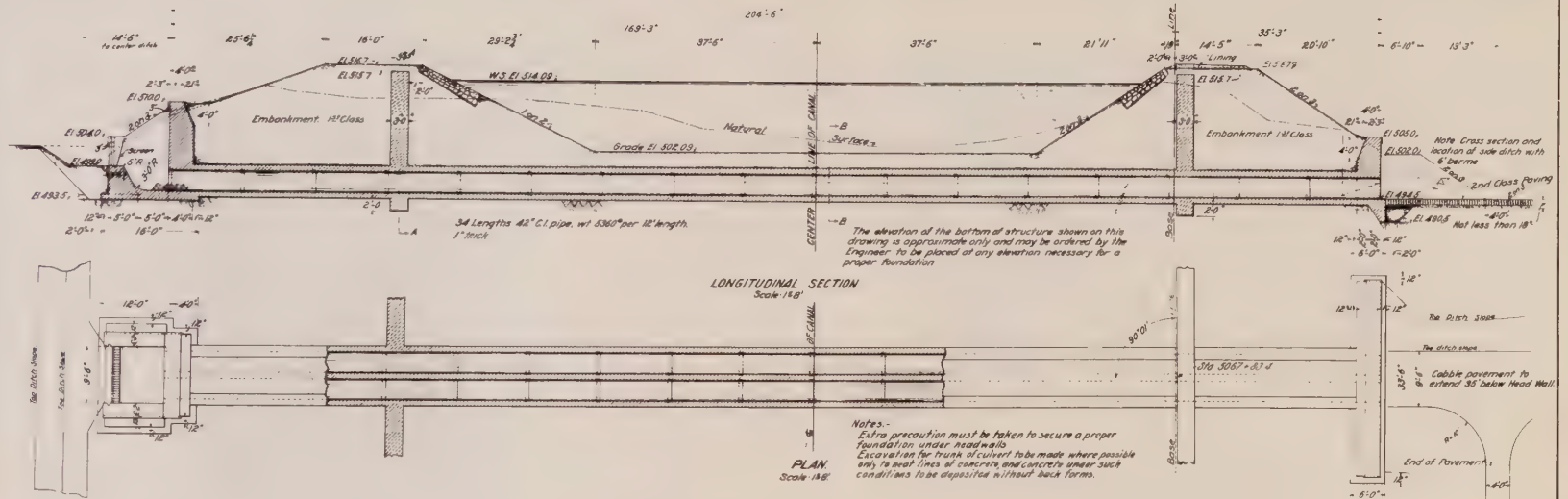


Recently rebuilt grated entrance



Exit

Headwall appeared to have been refaced with 1-3" of concrete. Facing was now delaminated and cracked. Top of pipe 6" under water. Drainage channel needs cleaning.



Contract No. 64.
Erie Canal Section 10.
Between Medina and Genesport
DETAIL PLANS FOR CULVERT
AT STA. 5067+83.4
OLD CULVERT NO 101
Scales as indicated

Examined and approved
Special Inspect. Sta. 1-12 Nov.
February 8, 1908



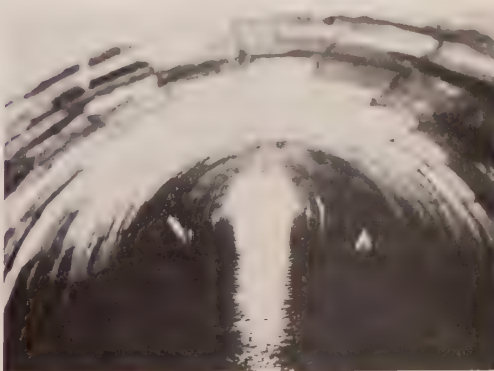
Entrance

Headwall and wingwalls in fair condition due to areas of efflorescent covered cracks.



Exit

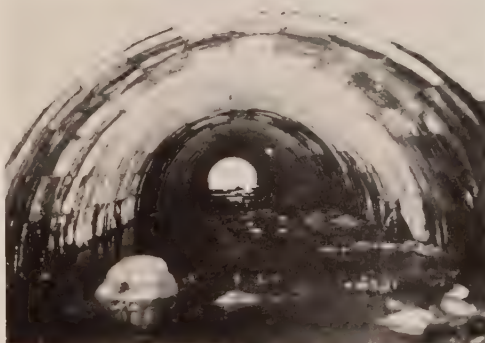
Headwall and right wingwall in fair condition due to many efflorescent covered cracks. Left wingwall in good condition, except for top next to headwall.



Looking North from Entrance
Approximately 6 large leaks seen in 1975

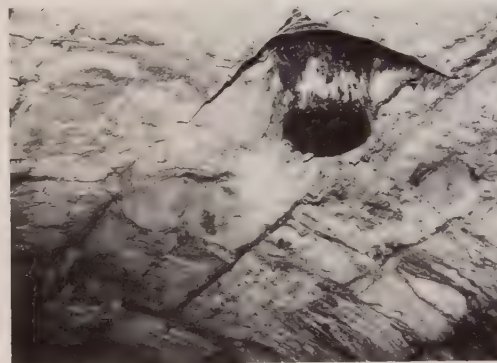


Exposed Top of Arch Barrel - April 1976, Looking South.
Back side of 1825 Erie Canal culvert headwall. Arch in foreground was covered with concrete many years ago. In 1976, the 10' in front of the headwall was covered with concrete. This stopped a few leaks, but another 30' of uncovered stone block arch exists on the other side of the Erie headwall where most leaks exist.



Looking North from Entrance

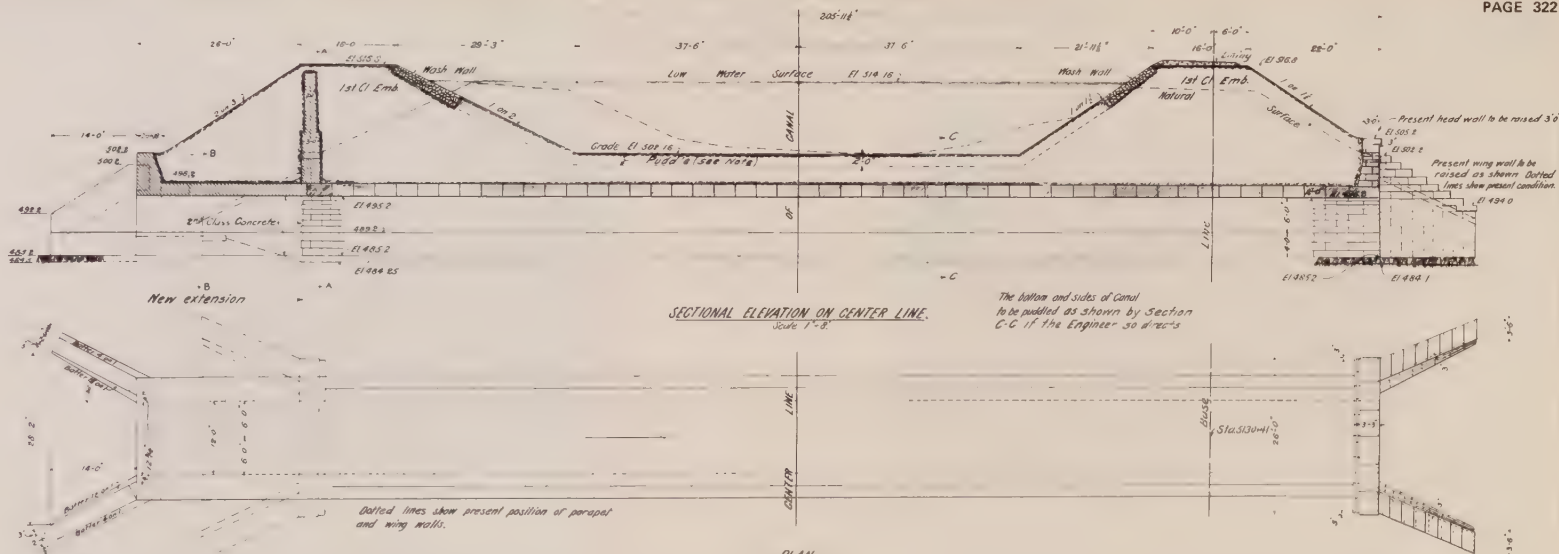
After repairs in 1976, a few leaks stopped, but others remained. Note heavy drippage in foreground and water squirting out right wall in 2 places part way down the barrel.



Stone Block Arch Area at Center Drain

1' square hole 3' up alongside pipe. No leaks.
1' X 4' block has dropped 3-4". Top of arch capped with concrete.

At the south (entrance) end, the 30' long concrete arch was in good condition. Heavy drippage at joint with stone blocks. Near joint, 2 blocks had 1' square, 10" deep holes. Heaviest leakage occurred about 75' from the south entrance. 6 or more good size leaks were evident mainly in the south 1/3 of the stone block section. Approximately 6 places where a block has partially fallen out. Adjacent to the north end concrete arch, a 1 foot square block has dropped 1". At the center drain, a 1' X 4' stone block has dropped 3-4". A 1' square hole existed 3' up along side the 8" diameter drain. This hole may have been made during drain installation. Whole area must be thoroughly capped with concrete around top of center drain as no leaks existed here. Many blocks have cracked horizontally along bedding planes a few inches apart. North end concrete arch was in good condition. Repairs needed.



The location and sides of Canal to be published as shown by Section C-C if the Engineer so directs

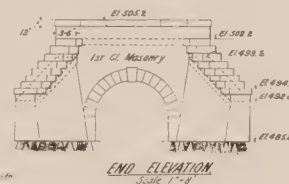
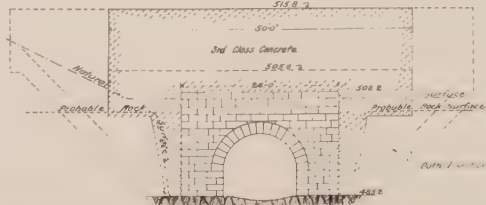
PLAN
Scale 1"=8'

Note

The cut-off wall is to be placed upon the old head wall, removing as much of old head wall as is loose or in poor condition as the Engineer may direct.
A good bond is to be made with the old arch.
Every other ring stone of the arch is to be cut back at least 3".

Note

The excavation for cut-off at the end of present head wall is to be made to rock surface.
The Engineer may alter the location and section of cut-off wall to meet conditions as found.
Core wall to extend 8' in rock and 3' in earth beyond excavation lines.
The bases of structures shown on these plans shall be considered as approximate only, and may be ordered by the State Engineer in writing to be of any elevation and of any dimensions necessary to give a proper foundation.
Round exposed edges of concrete to a 1' radius



SEE CHANGES
PAGE 323

Contract No. 64.

ALTERNATION NO. 2.

Erie Canal Section 10

Between Medina and Gasport.
REVISED DETAIL PLANS FOR CULVERT AT
STA. 5136+41.09
OLD CULVERT NO. 103
Scales as indicated

Examined and approved.

Wm. B. Landolt
Special District State Engineer.

Aug 3

148 9

Superseding sheet No. 32.

MADE BY E.G. Bessing
TRACED BY
1st CHECK BY S. H. Rogers, July 64
2nd CHECK BY

END ELEVATION
Scale 1"=8'

Follow dotted lines if section is in earth.

B-B
Scale 1"=8'

Use section as shown by dotted lines when section is in earth

C-C
Scale 1"=8'



Entrance

Headwall and wingwalls in good condition. A few efflorescent covered cracks on right wingwall.



Exit

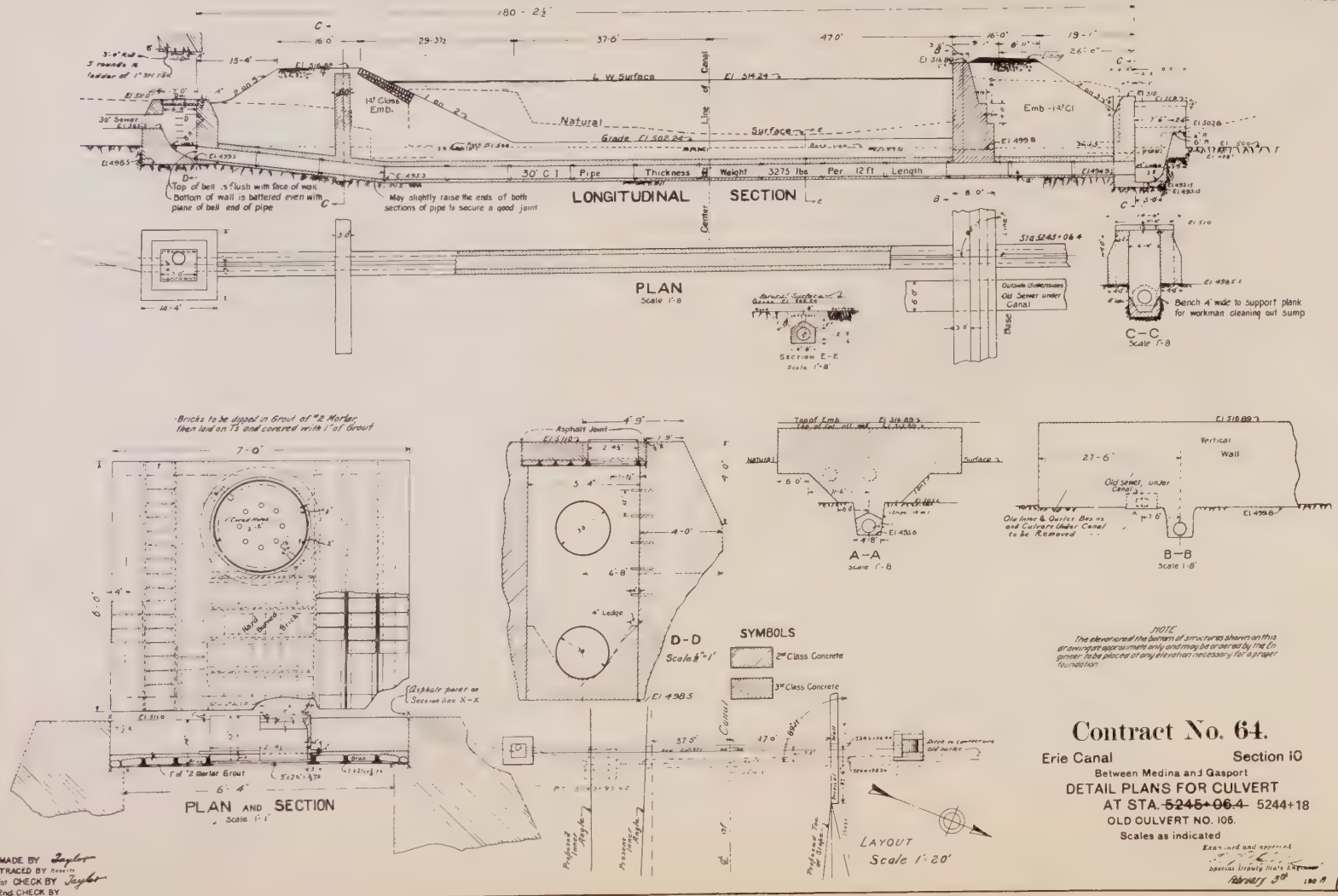
Headwall in fair to good condition with a few cracks and scaled areas around culvert barrel.

Cast iron pipe culvert in good condition. $\frac{1}{2}$ " thick steel plate patch near center ready to fall off, but probably another one exists on the outside and the pipe is encased in 1' of concrete. 8" flowing pipe from sewage treatment plant runs into entrance. Pipe $\frac{1}{3}$ filled with mud. No leaks.



Exit

Headwall and wingwalls in good condition. Note culvert well covered with planks.



Exit Area



Looking North Along North Embankment in Middleport
Culvert #107 exit is located in the distance by the
3rd telephone pole.

The north embankment in Middleport is narrow and steep due to the nearness of the road and homes. It does not meet current criteria for canal embankments. Plans are now under design for the reinforcing of this embankment area.



Exit

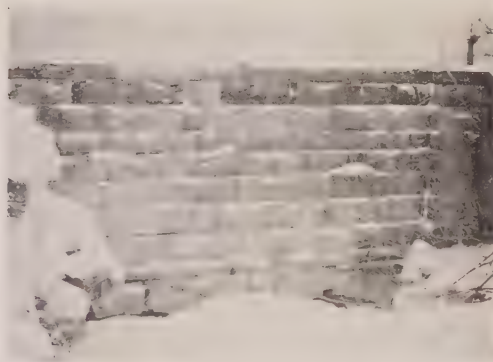
Headwall was in fair condition with a number of efflorescent covered cracks. Dark circular holes are weep drains.



Exit

View of exit area from under roadway bridge.

Culvert #107
Entrance Area



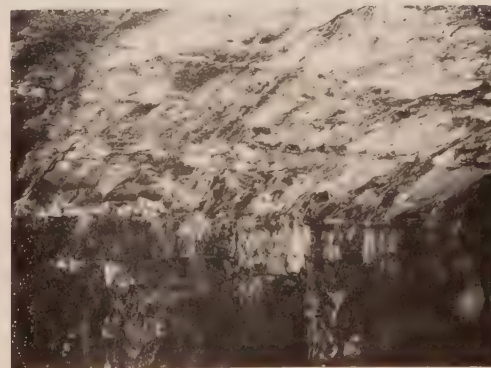
Stone Block Retaining Wall over Culvert #107
Entrance. Middleport Waste Gate is at right.



Culvert #107 Entrance
Stream in foreground (very little flow) cascades over
5' high wall and down into culvert well. Water at
right is flowing from canal waste gate. Floor of
culvert is bedrock.



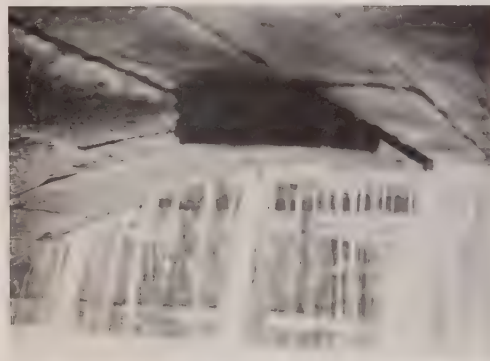
Unstable Stone Blocks on Left Side of Entrance
Area



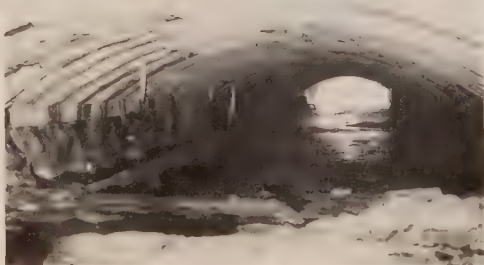
East Barrel Near Exit End
Stone blocks are breaking apart and pieces are slowly
falling out. There were only a few areas like this,
of which the above was probably the worst.



West Barrel Entrance
Heavy leakage through retaining wall and keystone in arch has slipped down a little. Picnic table was washed or thrown into culvert entrance.



Looking Out West Barrel Entrance-Fall 1975
Not only had the keystone slipped, but the stone behind it had also fallen down about 5".



West Barrel-Looking North Toward Exit
Note 12" diameter sewer pipe along west side.



Looking Out West Barrel Entrance-Winter 1977
A year later, part of another stone block had slipped down just inside the entrance.



East Barrel Entrance
Keystone has partially fallen out as well as sections at west end of arch. There also appears to be a slight dip in the horizontal wall joints above the entrance.



East Side of East Barrel Entranceway
Many cracked and partially missing stone blocks.



West Side of East Barrel Entranceway
Many cracked and partially missing stone blocks.

Both barrels of this culvert were in similar condition. Generally, the stone block arches appeared in good condition, except at the entrances. There was minor drippage throughout the northern 2/3rds, but the southern 1/3rd (entrance end) contained a number of drip size streams and constant drippage. The entrance area has a number of fractured and partially missing stone blocks, and is in danger of collapse.

Work is presently underway by Canal Maintenance Personnel to repair the entrance area of this culvert. The ends of both barrels are to be lined with corrugated metal and leaks through the retaining wall sealed.



Exit

Headwall and wingwalls in fair to good condition. Left wingwall had more cracks than right wingwall.



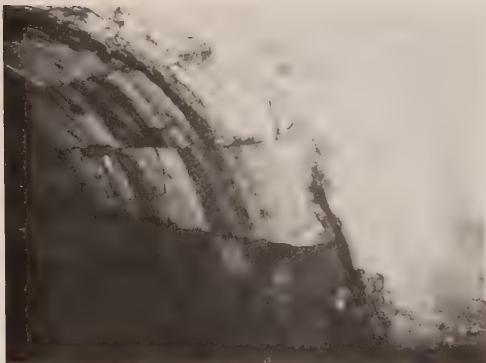
Entrance Area

Abandoned mill collapsed into culvert entranceway and had to be cleaned out. Water at left from Watsons Waste Gate. Headwall and right wingwall in fair to good condition with cracked and scaled areas.

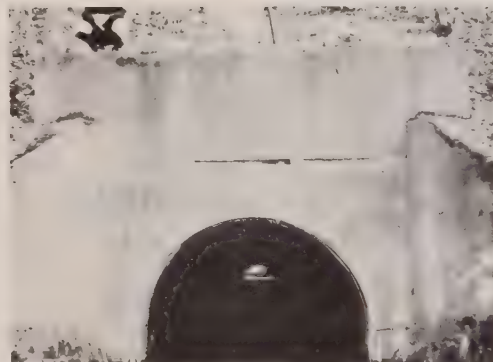


Entrance Area

Left wingwall or retaining wall had a large hole in it and was deeply scaled along the bottom half. Part of the old mill foundation on left has slid down and the top could fall at any time.



Joint Area Behind Entrance Headwall
Nearly all blocks next to the headwall were cracked
and holes up to 1' deep existed all around arch.



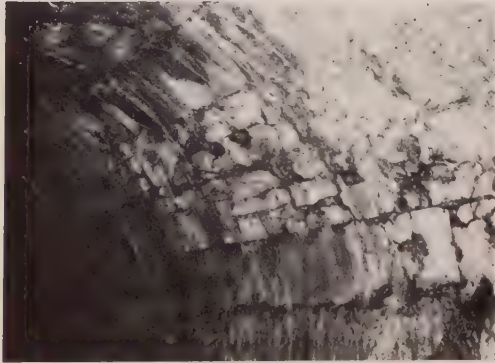
Exit
Headwall was in fair condition with a vertical crack
over the arch and a number of cracks on the lower
section. Both wingwalls were in good condition with
only a few scattered cracks.



Looking South From Exit

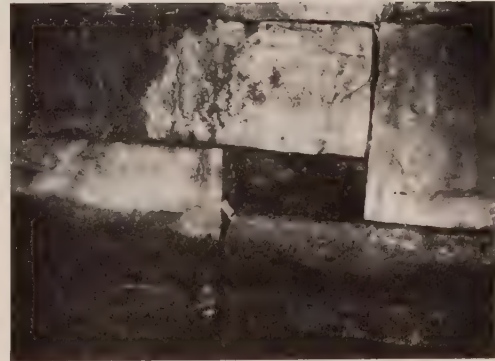


East Wall Near Exit
Blocks appear to have moved (possibly open joints)
and wood timber or pile exposed next to exit headwall.



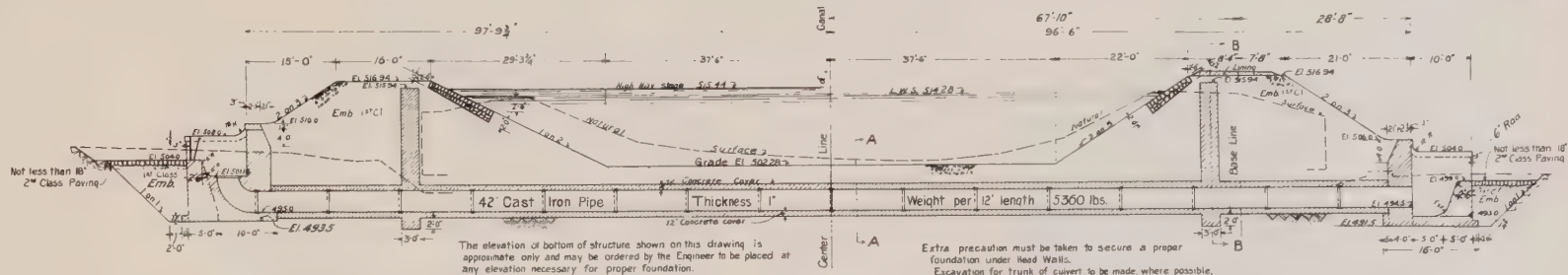
Fractured Stone Blocks
Cracked blocks were seen in a few areas.

The culvert was in generally fair to good condition. 4 drip size streams existed near the south (entrance) end and spotty slow drippage was noted in a few areas, but large areas were dry although stains indicated past leakage or slow seepage. 2 blocks were partially missing up to 4" deep.

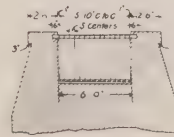
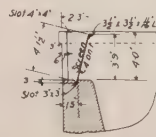
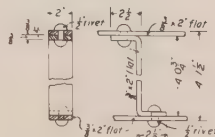
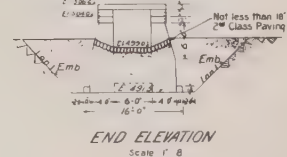
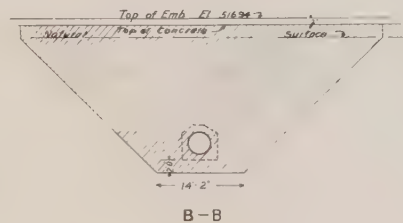
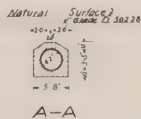
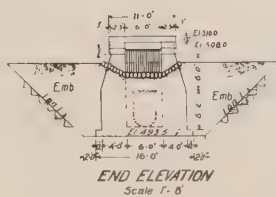
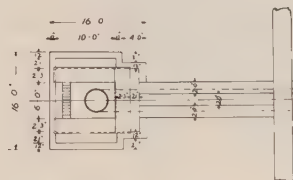


Approximately 6" x 12" Block Missing or Never Placed
Rocks and gravel seen in hole on west wall. Another void was seen on the east wall behind a gap in the wall. Both areas were dry.

Open joints between blocks and the joint area behind the entrance headwall should be repaired. Repairs are also needed on the left wingwall at the entrance and dangerous conditions outside the entrance should be removed.



LONGITUDINAL SECTION
Scale 1" = 8'



DETAILS OF SCREEN

Screen to be fastened to angle by 1" chain and approved lock
Screen to be painted as per bridge specifications

Contract No. 64.

Erie Canal Section 10

DETAIL PLANS FOR CULVERT

DETAIL PLANS FOR CULVERT

AT STA. 5285+~~98.2~~ 48

OLD CULVERT NO. 108

Scales as indicated.

Figure 10.10.1

225

Spring 1864

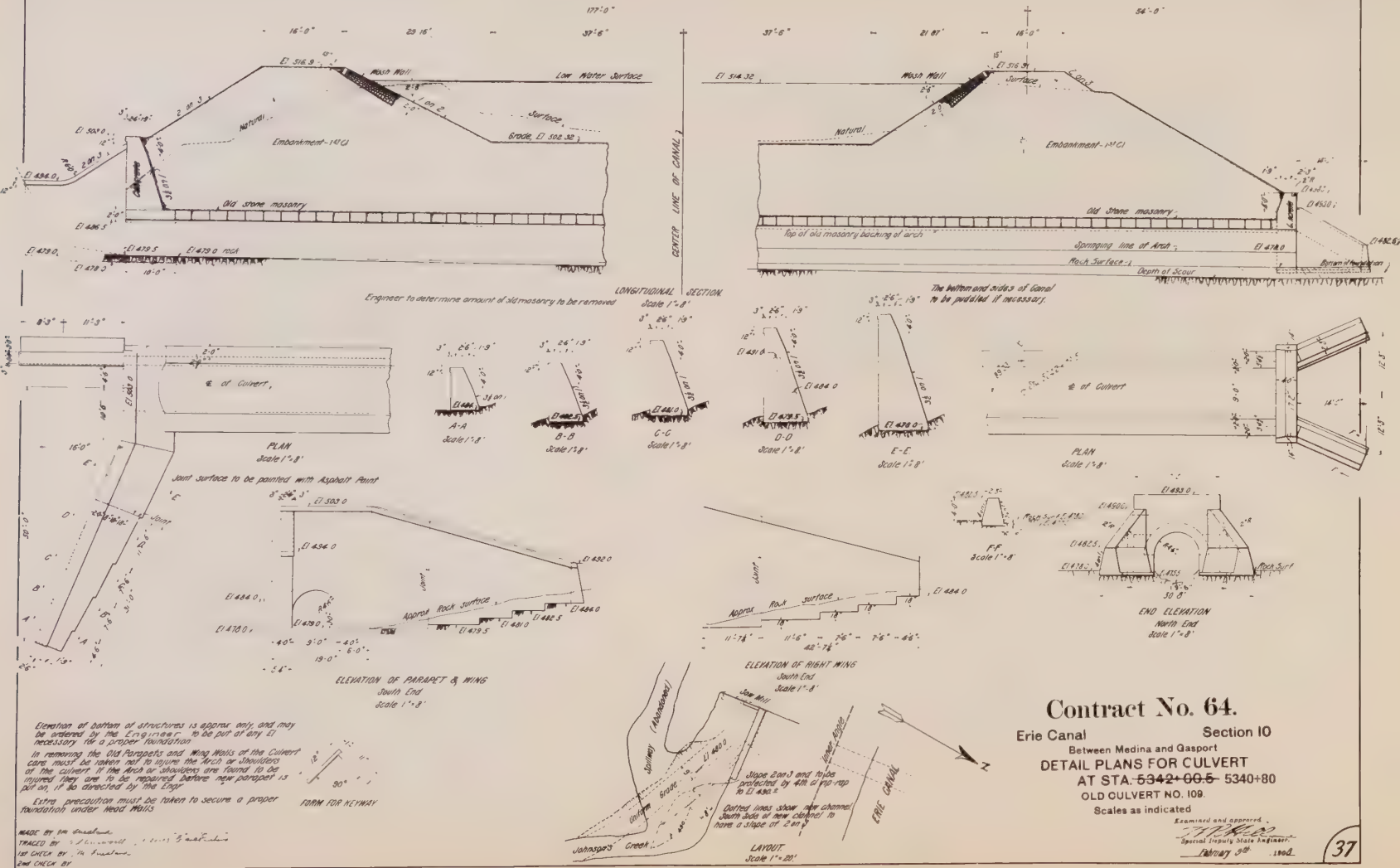
February 5th

— (W. 50) —

MADE BY Blessing
TRACED BY F Roberts
1st CHECK BY Blessing
2nd CHECK BY *Isa Friedman*

Layout
Scale 1" = 50'

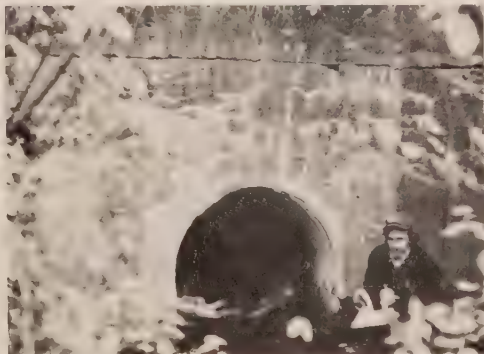
36





Entrance

Headwall appeared in poor condition with many cracks. Wingwalls were in fair condition with fewer cracks.



Exit

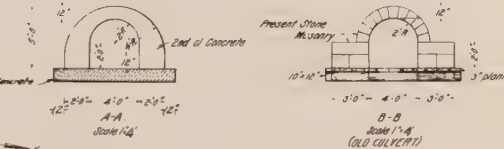
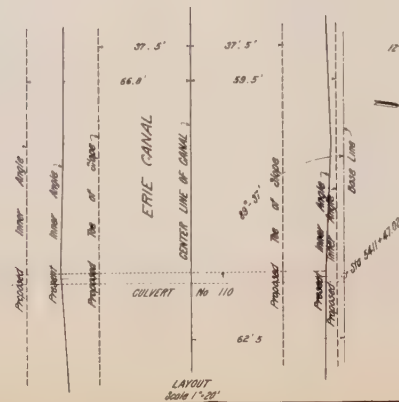
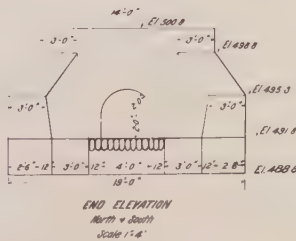
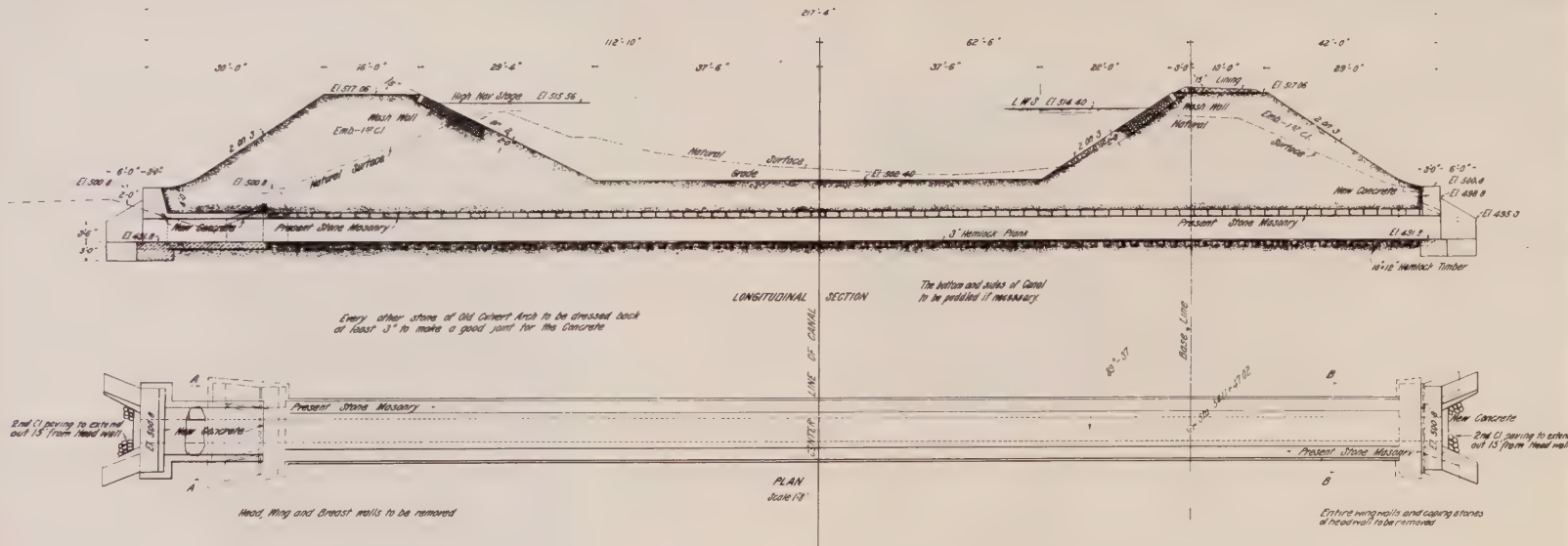
Headwall and wingwalls were in poor condition with many cracks and delaminated areas. The whole headwall appeared to have moved as there was a 2" gap between it and the cast iron pipe.



Hole Behind Exit Headwall

Soil has been washing into the culvert through a 2" gap between headwall and pipe. A 1' wide by 6' long hole was behind the headwall and, from inside the culvert, daylight could be seen through gap.

Cast iron pipe was in good condition. Slow seepage through joints and at center drain. Concrete arch at south (entrance) end in good condition. Headwall areas, especially north (exit) end, need repair.



NOTE

The elevation of bottom of structure shown on this drawing is approximate only and may be determined by the Engineer to be placed at any elevation necessary for a proper foundation.

SEE CHANGES

Contract No. 64.

Section 10

Between Medina and Gasport

DETAIL PLANS FOR CULVERT

AT STA. 541+47.02 5410+40

OLD CULVERT NO. 110

Scales as indicated

MADE BY *Elmer J. 238*

TRACED BY *J. H. 238*

1/2 CHECK BY *Elmer J. 238*

2/2 CHECK BY *Elmer J. 238*

Examined and approved

J. H. 238

Special License No. 1000

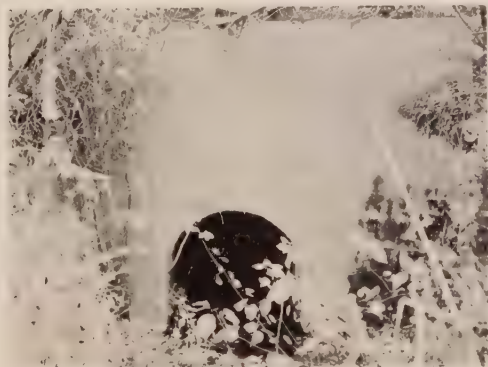
February 5, 1902

Culvert #111 188' of 48" Cast Iron Pipe
20.5' of 4' X 4' Concrete Arch



Entrance

Headwall was covered with cracks, scaled at top and delaminated. Wingwalls were deeply scaled along the top.



Exit

Headwall and wingwalls had many cracks. Right wingwall was delaminated.

Cast iron pipe and concrete arches at both ends were in good condition. Slow seepage through joints and at center drain.

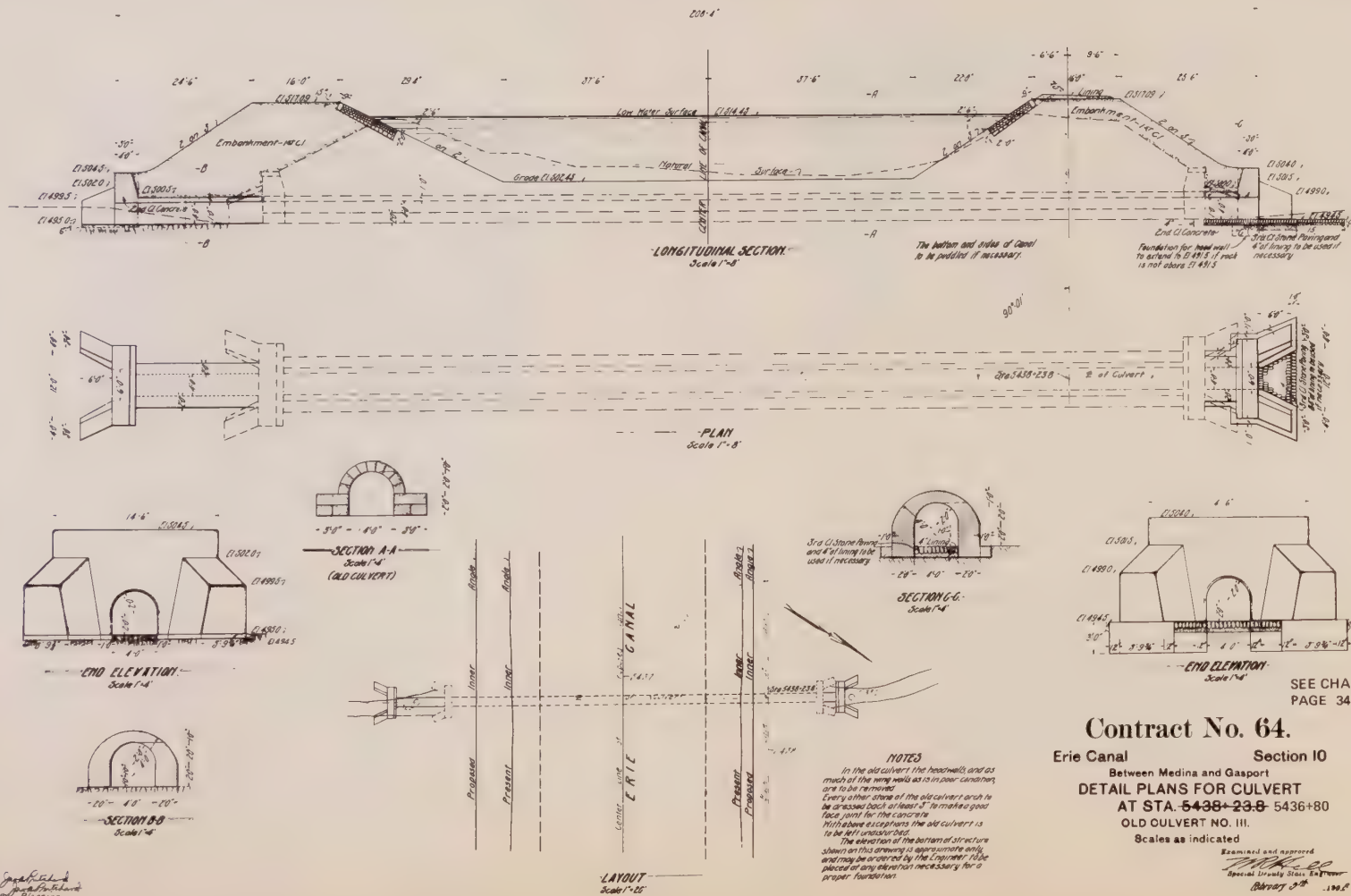
Culvert #112(Dive) 207.5' of 36" Cast Iron Pipe
Not Inspected

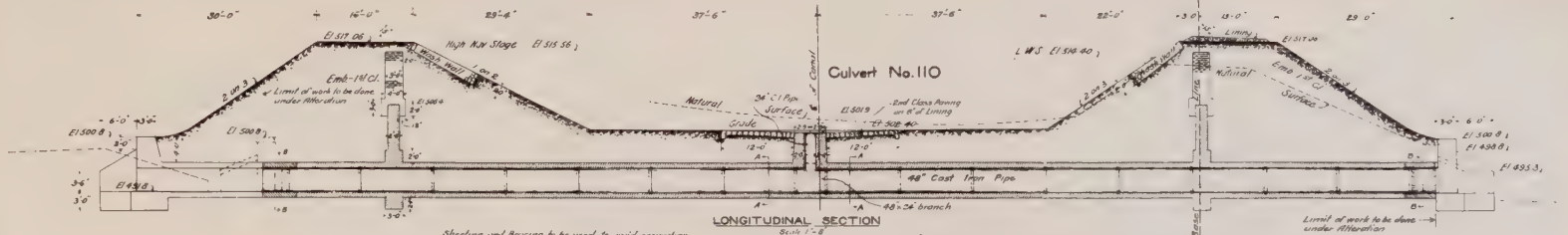
PAGE 339



Exit

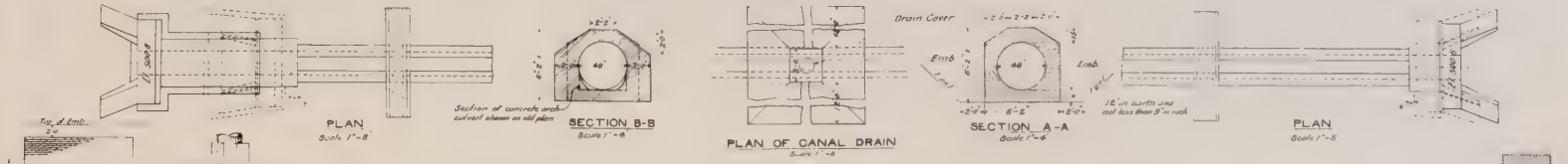
Top section of headwall and most of wingwalls in good condition. Bottom section of headwall cracked and scaled. Ends of wingwalls cracked, scaled and delaminated.



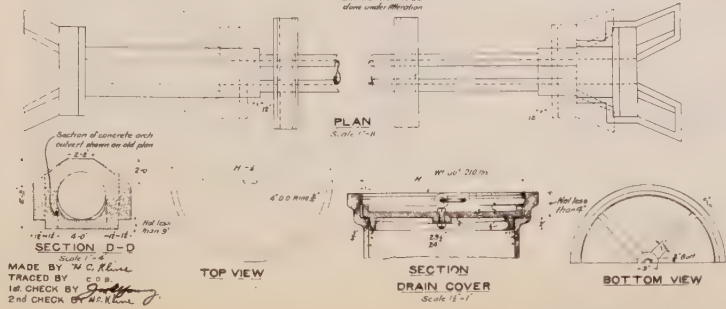


Shedding and Bracing to be used to avoid excavating slopes where so ordered by the Engineer.
Shedding and Bracing shall be paid for in master sheet piling.
Length of concrete core walls and length and run of puddle slaps (Pans) to be determined by the Engineer.
Core walls, if in rock, must not extend below bottom of culvert.

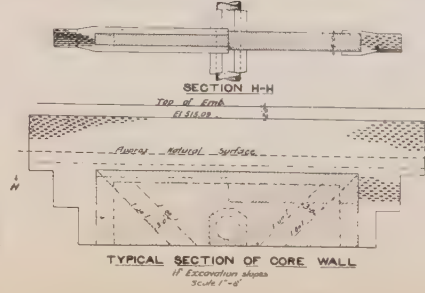
Edges of paving are to be protected by a course of stone at least 18\"/>



TYPICAL SECTION CORE WALLS
If shedding and bracing is used



MADE BY N.C. RINE
TRACED BY N.C. RINE
10. CHECK BY [Signature]
2nd CHECK BY [Signature]



Contract No. 64.

Erie Canal Section 10

Between Medina and Gasport

ADDITIONAL DETAIL PLANS FOR CULVERTS

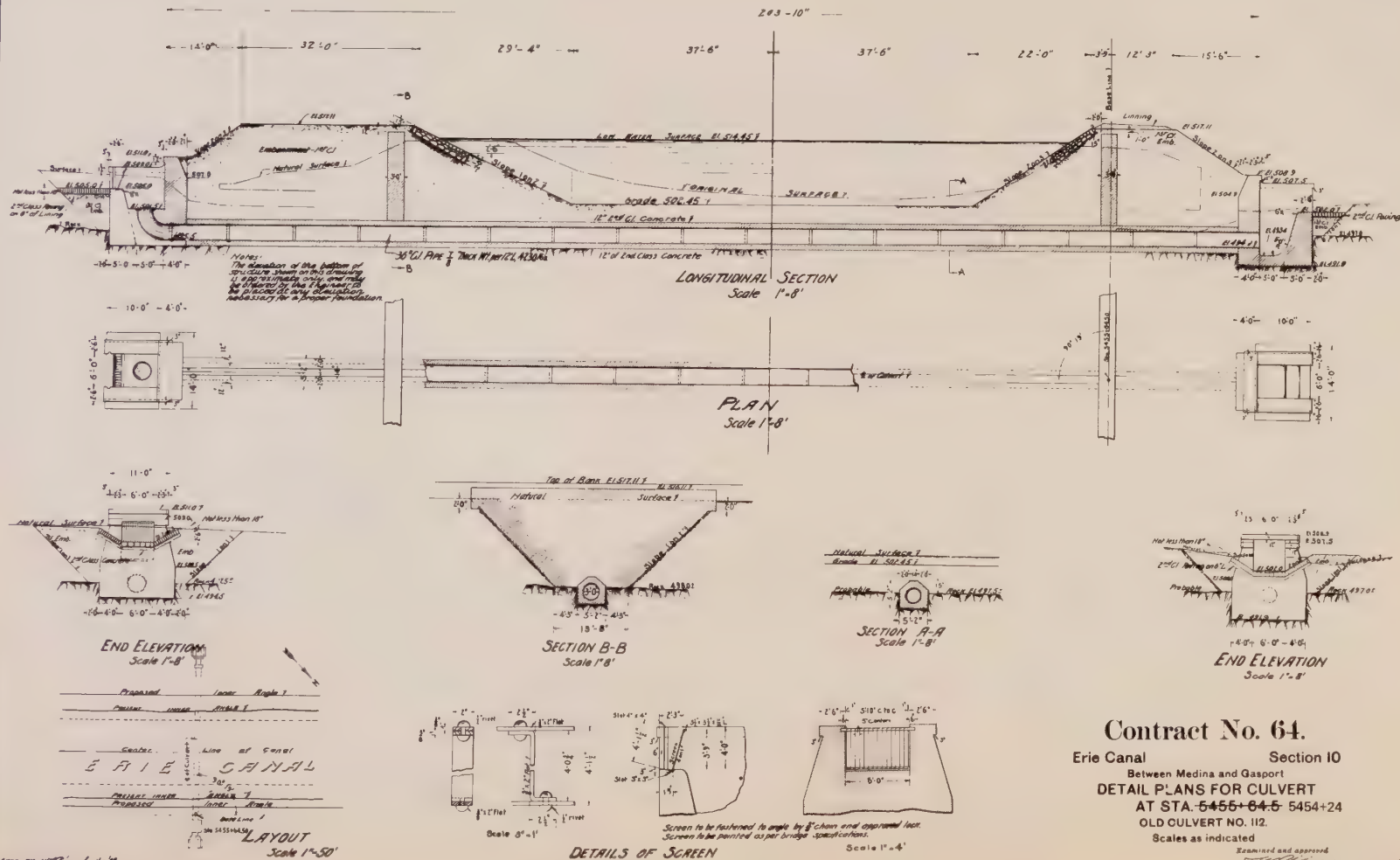
AT STAS. 5411+47.02 & 5436+23.6 5410+40

OLD CULVERT NOS. 110 & 111 5436+80

FOR OTHER DETAILS SEE SHEETS 38 & 39

Scales as indicated

Drawn by [Signature]
Checked by [Signature]
Date 15 1909





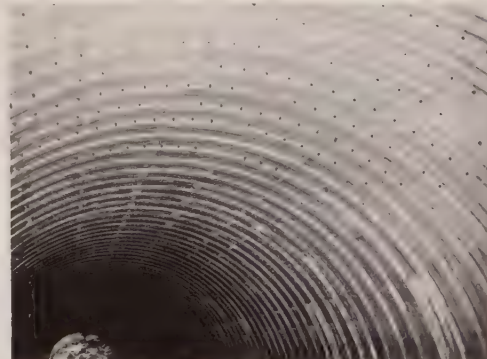
Entrance

Headwall generally in good condition. A few efflorescent covered cracks and delaminated around the edge of the arch. Wingwalls in fair to good condition with areas of efflorescent covered cracks.



Exit

Headwall and wingwalls generally in good condition. Lower end of right wingwall extensively cracked and sounds delaminated. Culvert rests on bedrock.



South End - Looking North

From the entrance to about 15-20' in, the bolts used to hold the plates side by side have rusted. All other bolts were not rusted.



Looking North From Near Center of Culvert

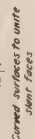
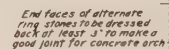
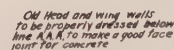
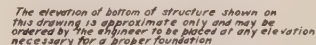
Most of the staining and drippage was concentrated from the middle of the culvert to more than halfway to the exit. A concrete encased utility line runs along the west side of the barrel.



Abandoned Trailer Truck Body

This truck body was very dangerously perched on the side of the stream bank and ready to slide down. Even if it is not on state land, it should be removed.

The steel liner plates looked in good condition. There was drippage and strains throughout the length of the culvert, but most wet areas, stains and drippage were concentrated from the middle to more than halfway to the exit. Mortar stains around the numerous plugs in the liner plate indicate that grout was placed behind the liner. However, the grout has not been 100% effective in stopping leaks.



LINED WITH CORRUGATED METAL IN
1967 UNDER CONTRACT M67-9

Erie Canal Section 10

Between Medina and Gasport
DETAIL PLANS FOR CULVERT
AT STA. ~~5486+64.9~~ 5485+40
 OLD CULVERT NO. 113

Scales as indicated

Examined and approved

W. H. Hill
Special Deputy State Engineer

February 5th

1008

(4.1)

MADE BY *Taylor*
TRAGED BY *A* UPON FEB 4, 88
1ST CHECK BY *Blessing Zak E. 88*
2ND CHECK BY



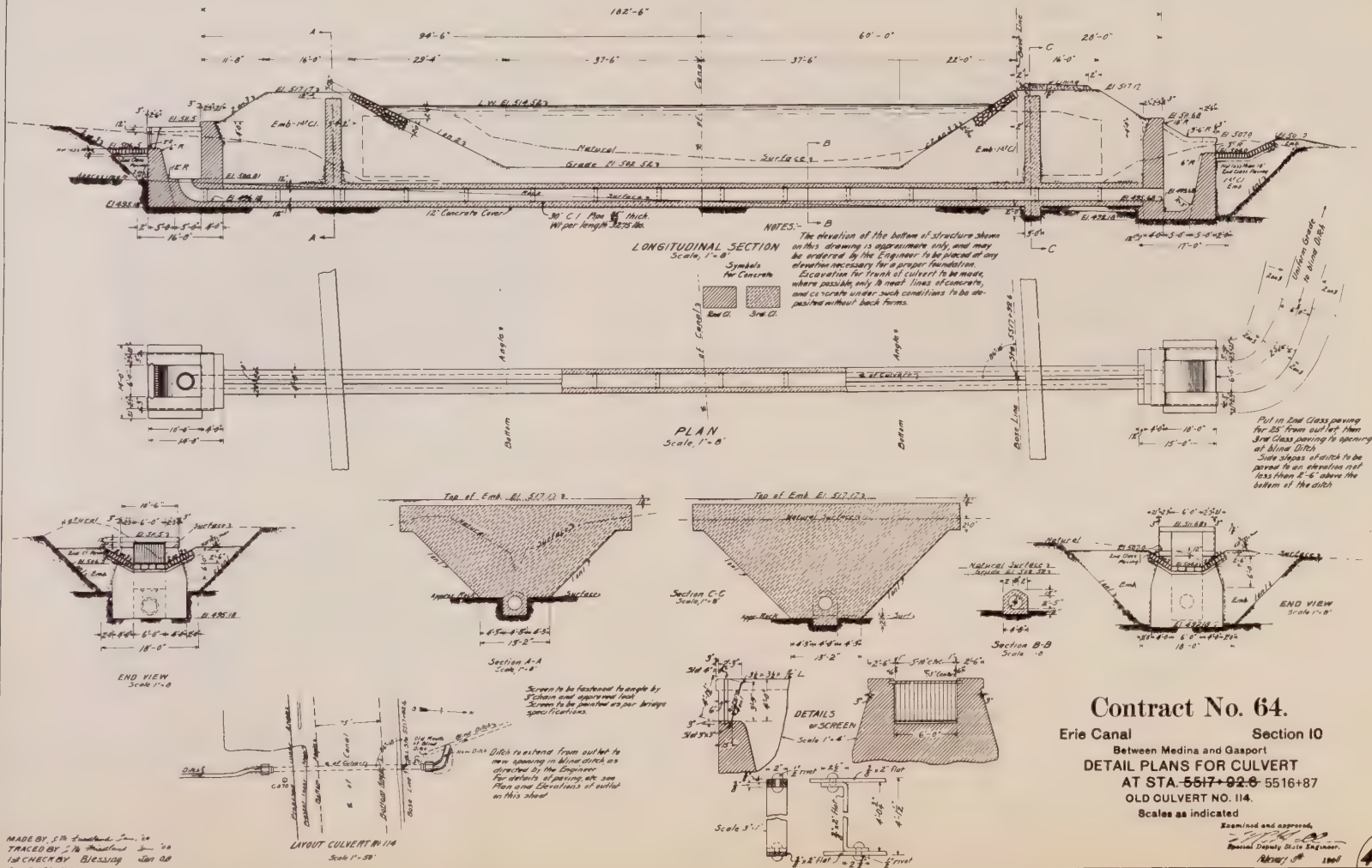
Exit
Headwall and wingwalls in good condition. A few
cracks on left wingwall. Sewer



Exit
Headwall and wingwalls in good condition. Abandoned
3" gas pipe attached to east wall.

Entrance
At entrance end of culvert is a 6' square, 8' high concrete well. A 30" corrugated metal pipe and a metal grate, located in a shelf area on the south side of the well, allow water in. The water then cascades down the south wall. A concrete slab covered the well and there was a 6" gap between this slab and the slab holding the metal grate. The gas pipe went straight up the north wall of the well and out through the slab. All concrete inside the well was in good condition.

The concrete culvert was in good condition. Slow seepage through most of the joints.



LONGITUDINAL SECTION

Scale 1" = 8' 0"

Note -
Barrel of culvert above top of floor to be classified as 2nd class reinforced concrete.

Note - The elevations of bottom of structure shown on this drawing are approximate only and may be ordered by the engineer to be placed at any elevation necessary for a proper foundation. Extra precaution must be taken to secure a proper foundation under headwalls.

Erection for Trunk of culvert to be made where possible only to rest mass of concrete on "wearing" under such conditions as to be in service without headwalls.

Culvert to be built in sections 20 ft. long.

Decent 13 gals. of new concrete to be placed in the culvert to be about 110 ft. long.

PLAN

Scale 1" = 8' 0"

SECTIONS SHOWING SCREEN

Scale 1" = 4' 0"

Screens to be fastened to angle by 1/2" chain and approved lock. Screen tube painted on per bridge specifications.

SCREEN DETAILS

Scale 1" = 4' 0"

ELEVATION OF NORTH END

Scale 1" = 4' 0"

SECTION B-B

Scale 1/2" = 1'

Longitudinal reinforcement to be placed in the bottom surface of floor.

Contract No. 66.

Erie Canal Section X.

Between Gasport and Lockport
DETAIL PLANS FOR CULVERT
STA. 5536+82-80
OLD CULVERT NO. 116
Scales as indicated

Examined and approved

Approved Deputy State Engineer.
May 1908

LAYOUT PLAN

Scale 1" = 50' 0"

SECTION A-A

Scale 1" = 8' 0"

SECTION C-C

MADE BY
TRACED BY
CHECK BY
2nd

Culvert #115½ 231.5' of 24" Cast Iron Pipe



Exit
Headwall in good condition.

Cast iron pipe in good condition. After crawling through, the entrance was grated over and could not get out to inspect headwall. Crawled out pipe backwards.



Cleanup in canal after inspecting culvert.

Culvert #116 (Dive)
191' of 4' Wide X 3' High Concrete Arch
Not Inspected

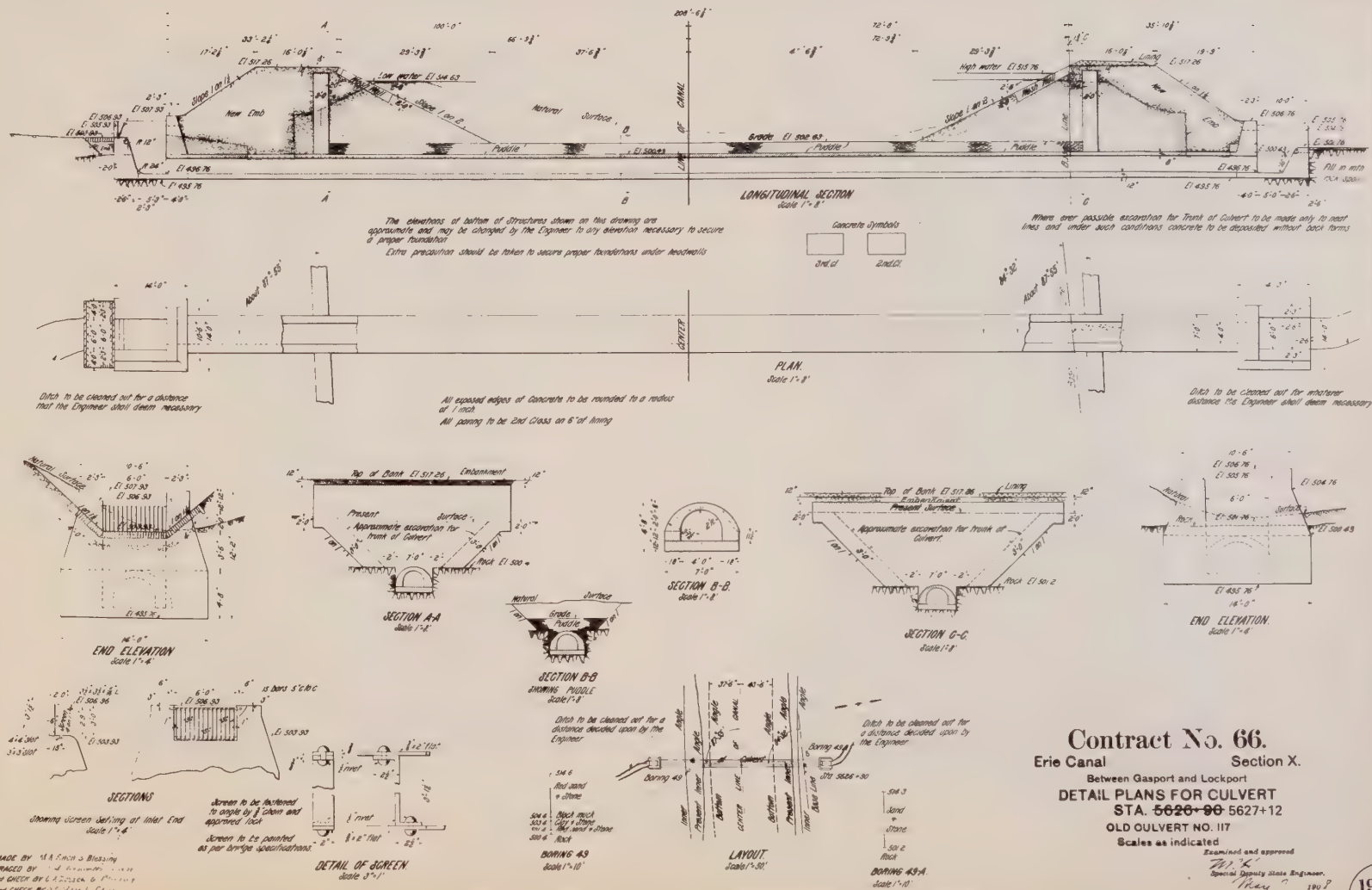


Exit
Headwall and wingwalls in good condition.
2 syphons - 2" inactive, 6" active.

Culvert #117 (Dive)
208.5' of 4' Wide X 3' High Concrete Arch
Not Inspected



Exit
Headwall and wingwalls in good condition.
A few cracks at near end of right wingwall.





Entrance

Headwall in good condition. Both wingwalls were deeply scaled along the bottom 2'.



Exit

Headwall and both wingwalls were deeply scaled and delaminated. Left wingwall was completely undermined just above water level and right wingwall partially undermined. Large hole in embankment behind headwall.



Typical Interior of Stone Block Arch



Looking Out North End or Exit

Note missing stone blocks or concrete behind headwall. Staggered blocks may mean that only concrete has fallen out.



Right Side of Arch Behind Exit Headwall
Embankment was washing into culvert where stone blocks or concrete had disappeared.

Embankment washing in through hole behind exit headwall. Spotty dripping throughout stone block arch. 4-5" deep scaling in concrete around center drain. South end of stone block arch (1st 40' next to concrete arch) contained nearly all the leakage. There were 4 constant drip streams and constant drips, and a $\frac{1}{2}$ " diameter stream coming through the joint between the 2 arch sections. Concrete arch at south end was in good condition.



Hole Behind Headwall
A 10' diameter 4-5' deep hole existed behind the exit headwall. Headwall is hidden by brush near far end of inactive 3" syphon.

Most of the culvert was in good condition, but the exit headwall area needs to be rebuilt and the leaks at the south end should be stopped.



Entrance

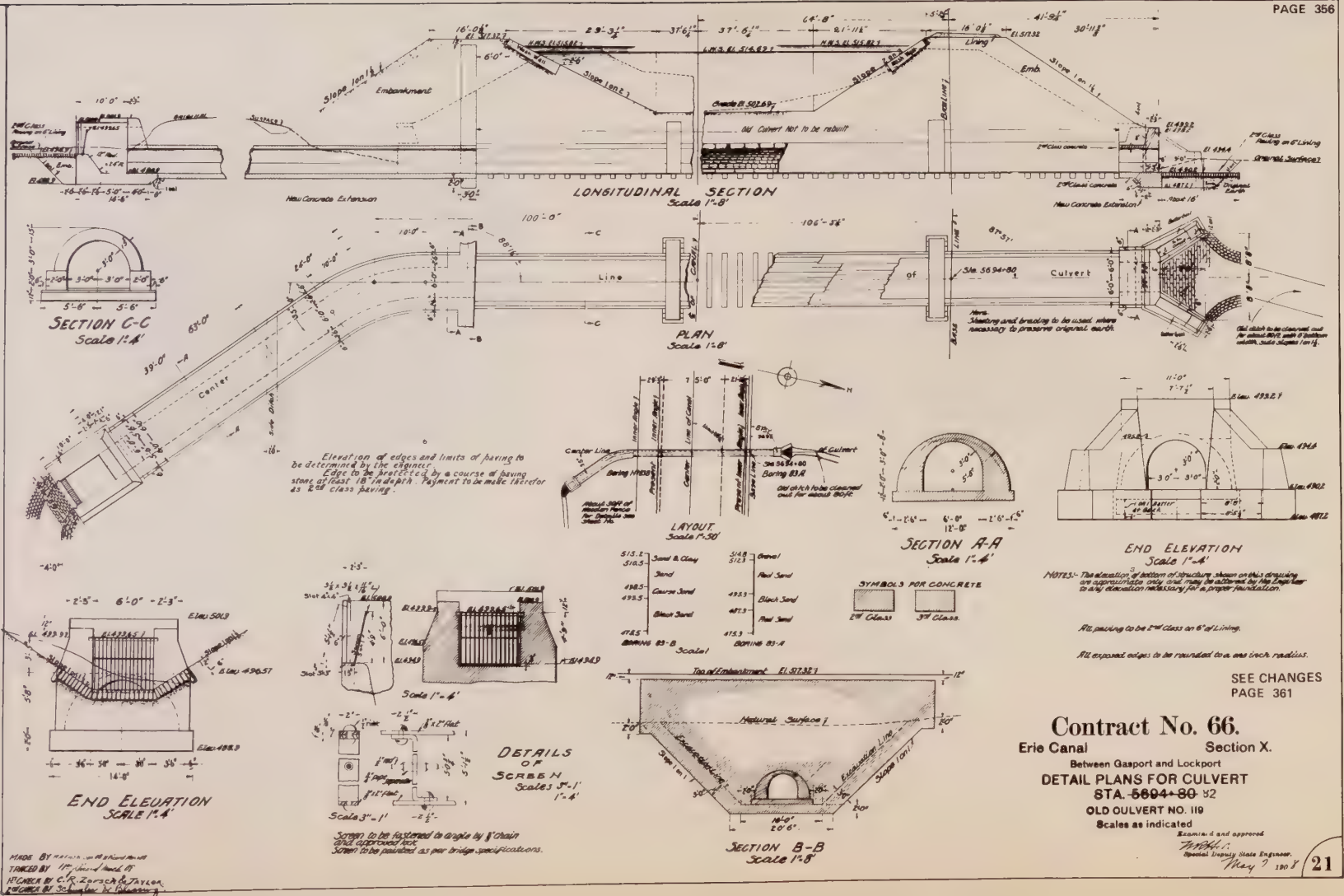
Headwall in good condition with a few scattered cracks. Both wingwalls had many cracks on their end sections, and efflorescent covered cracks on the bottom 3'.



Exit

Headwall and wingwalls were in good condition.

At the south end (entrance), a 90' long concrete arch bends and goes under road. The arch was in good condition, but a few joints were dripping. Leakage was heaviest at junction of twin cast iron pipes. 24" diameter drains at midpoint of both pipes drip slowly. Very little leakage through joints in both cast iron pipes. West barrel was clean, east barrel was half full of dry silt. North end (exit) concrete arch was 20' long (plans show only a 5' long section). Concrete arch in good condition, except for leak through midpoint construction joint. Culvert in good condition, except for a few small leaks.





Entrance

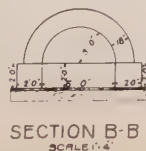
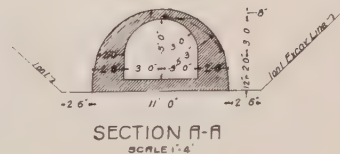
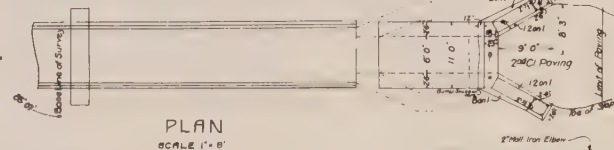
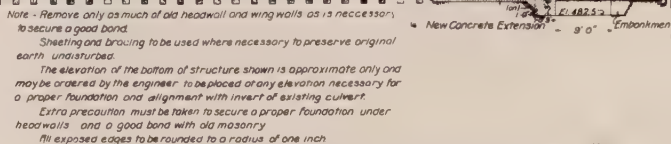
Headwall cracked vertically over top of entrance and scaled along joint, which continued along wingwalls, 3' up from the bottom. Headwall and wingwalls contained many small efflorescent covered cracks. End 2' of left wingwall was ready to fall off.



Exit

Corrugated metal pipe in good condition

From north to south (exit to entrance) - 1st 25' under the road is a new corrugated metal arch that was in good condition. Next 12' is a concrete box that is also under the road and in good condition. Then 30' of concrete arch was in good condition. Overhead grate and flowing underdrains at top of north end of concrete arch. Stone block arch under canal has scattered seepage and 12" center drain. There was 3" deep scaling on stone blocks and small concrete section around drain pipe. Concrete arch at south end was scaled along the joint 3' above the floor and scattered efflorescent covered cracks were on the last 6' of the arch. Culvert generally in good condition.



| No. 96 B | No. 96 A |
|--------------|--------------|
| 514.7 | 513.3 |
| Sand & Stone | Gravel |
| 505.4 | 504.0 |
| | Sand & Stone |
| Sand | 496.0 |
| | Sand |
| 475.4 | 475.0 |

Borings
Scale 1"=20'

MADE BY J. S. Turner - Dec 26-07 & Repaid
TRACED BY C. H. Harrison -
1st CHECK BY W. S. Shure, 1808
2^d CHECK BY J. M. Taylor

Between Gasport and Lockport
DETAIL PLANS FOR CULVERT
STA. 5722+07.15
OLD CULVERT NO. 120
 Scale as indicated

Examined and approved
W. H. 32
 Special Deputy State Engineer
May 7 190

Culvert #121 165' of 42" Cast Iron Pipe
 36' of 4' Wide X 3' High Concrete Arch
 29' of 4' Wide X 3' High Concrete Box



Exit

Headwall was deeply scaled, especially around the opening, and partially delaminated.

Entrance

Headwall in good condition except for vertical crack over opening. Wingwalls in good condition except for some efflorescent covered cracks on the end 2'.

Concrete box under roadway and concrete arch under edge of north embankment in good condition. At junction of two sections is an overhead grate and underdrains which drain ditch on south side of road. A 2' square X 3' deep hole was located just east of this grate at the toe of the canal north embankment. Cast iron pipe has slow seepage as most joints, but in good condition. Concrete arch at south end in good condition. Culvert in good condition, but embankment hole should be filled and joint sealed to prevent soil from washing in.

Culvert #122 235' of 4' Wide X 3' High Concrete Box PAGE 359



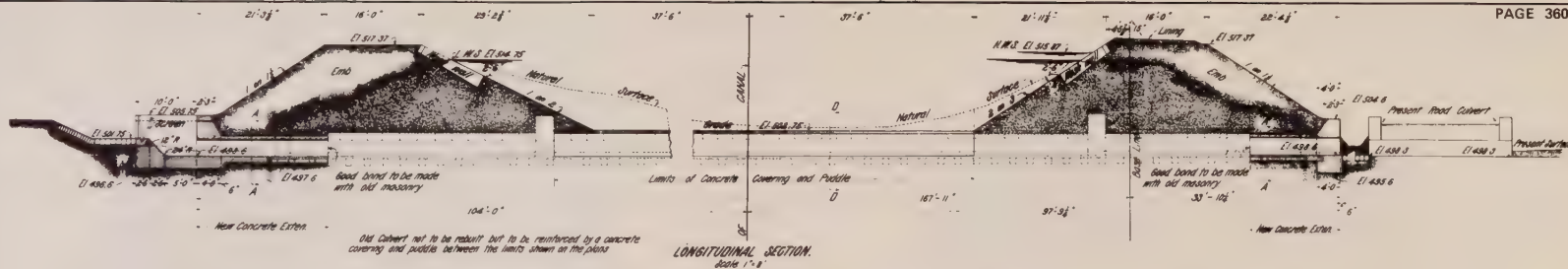
Exit

Headwall scaled all along the top half.

Entrance

Headwall and wingwalls in good condition

Concrete box in good condition. Slow seepage at some joints. Culvert was filled with 1' deep mud at time of inspection, but it was being cleaned out.



LONGITUDINAL SECTION
Scale 1"=8'

NOTES

The elevations of bottom of structures shown on this drawing are approximate only, and may be ordered by the Engineer to be placed at any elevation necessary for a proper foundation. Extra precaution must be taken to secure a proper foundation under headwalls. All paving used to be laid at with 6 in. of living. The elevation of edges and limits of paving to be determined by the Engineer. Edge to be protected by a course of paving stone of least 1 in. in depth. Payment to be made therefor as laid in paving. Charting and drawing to be used where necessary to preserve natural earth undisturbed. All exposed edges of concrete to be rounded to a radius of 1 inch. For details of work masonry see sheet No. 14. Remove only as much of the old head and wing walls as is necessary.

New ditch bottom width 4 ft. side slopes 1 on 1, grade 4.5% for about 15 ft. west of center line of culvert.

New side ditches to be dug as far as the Engineer shall decide on.

Clear out old ditch about 300 ft. if necessary.

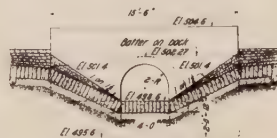
PLAN
Scale 1"=8'



SECTION D-D
SHOWING CONCRETE COVERINGS
Scale 1"=4'



SECTION E-E
Scale 1"=4'



ELEVATION OF HEAD-WALL
NORTH END
Scale 1"=4'

SEE CHANGES
PAGE 361

Contract No. 66.
Erie Canal Section X.

Between Gasport and Lockport
DETAIL PLANS FOR CULVERT
STA. 5746+43.5- 35
OLD CULVERT No. 121

Scales as indicated

Examined and approved
Special Deputy State Engineer.
May 7, 1908

MADE BY E. J. & S. J. L. L.
TRACED BY J. L. L. L.
1/2 CHECK BY E. J. & S. J. L. L.
2/2 CHECK BY E. J. & S. J. L. L.

CONCRETE SYMBOLS
2nd of 3rd of

LAYOUT
Scale 1"=10'

SECTIONS SHOWING POSITION OF SCREEN
Scale 1"=4'

Screens to be fastened to angle by 3/8" chain and approved test screens to be painted as per bridge specifications.

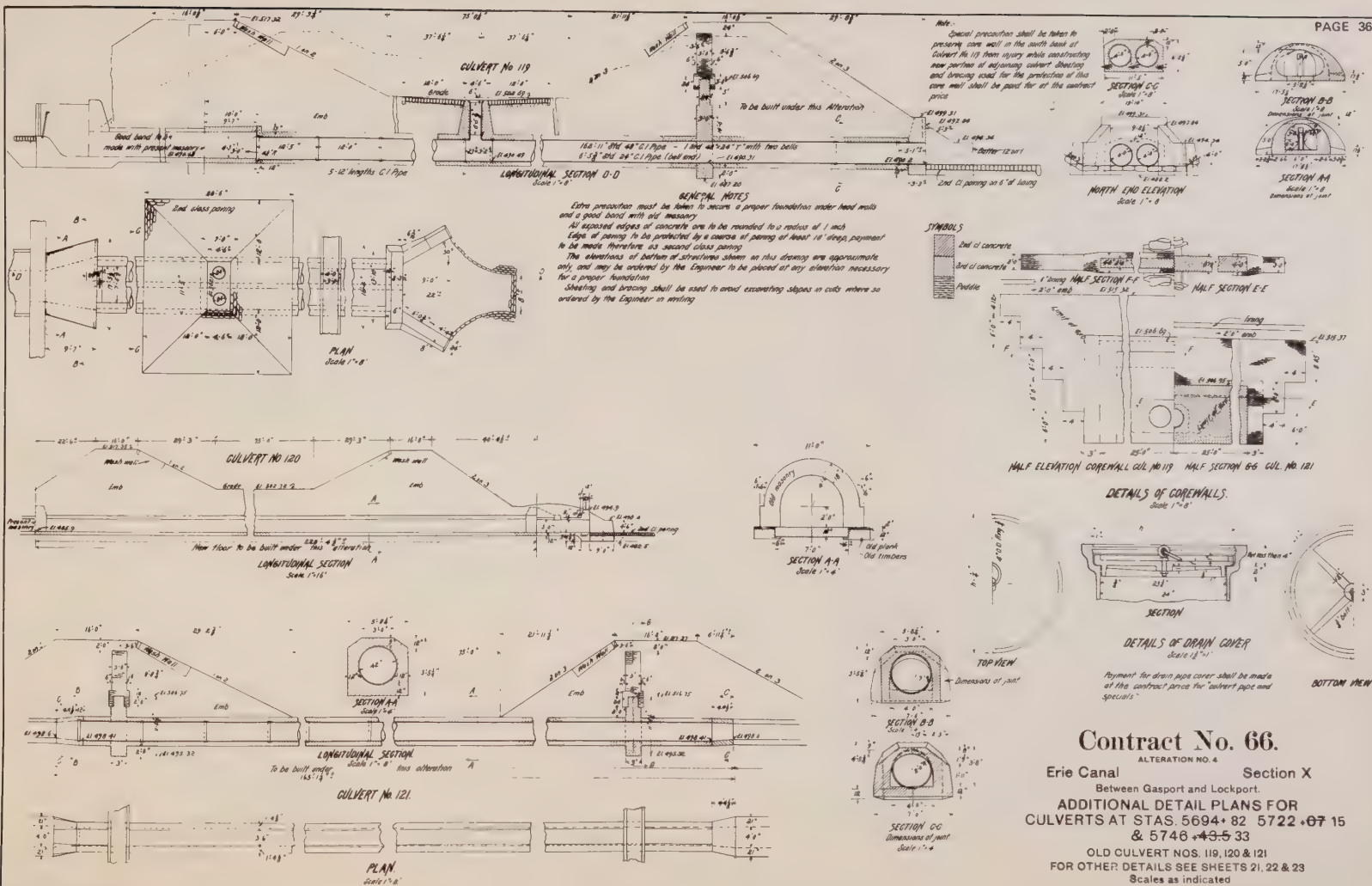
DETAIL OF SCREEN
Scale 1"=4'



SECTION A-A
Scale 1"=4'



ELEVATION OF SOUTH END
Scale 1"=4'



Contract No. 66.

ALTERNATION NO. 4

Erie Canal Section X

Report

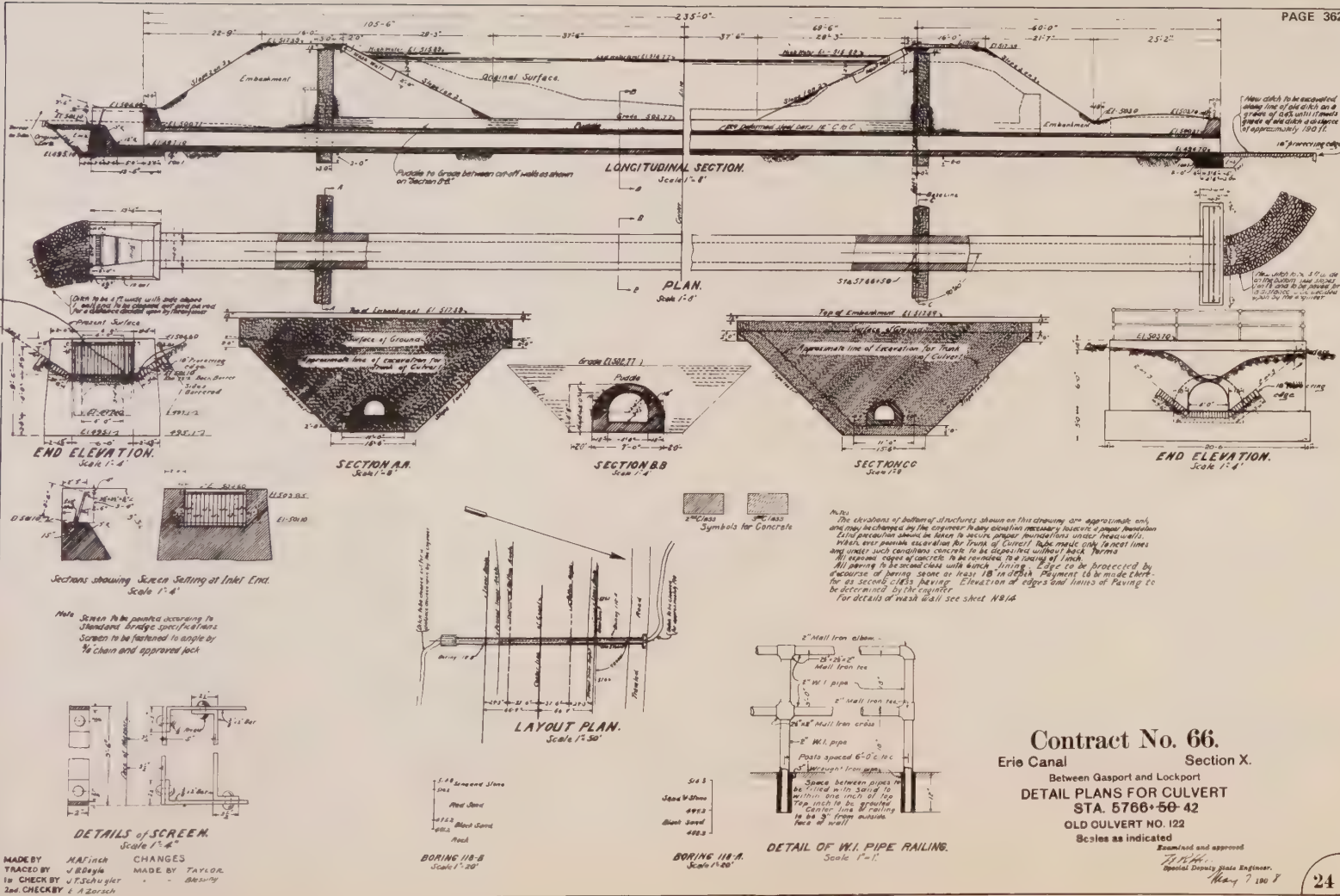
ADDITIONAL DETAIL PLANS FOR
CULVERTS AT STAS. 5694+82 5722+07 15
& 5746+43 533

OLD CULVERT NOS. 119, 120 & 121

FOR OTHER DETAILS SEE SHEETS 21, 22 & 23

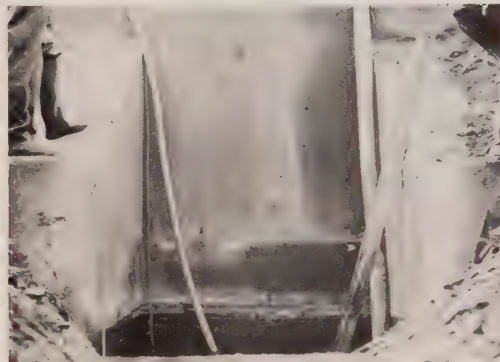
Scales as indicated.

Examined and approved
Wm B Landrith
 Special Deputy State Engineer
 Nov 15 1902





Entrance
Manhole entrance was in good condition.

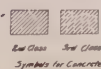
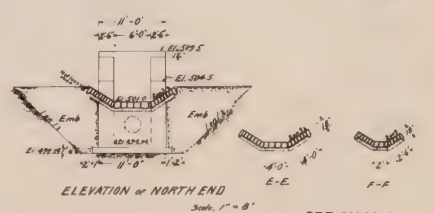
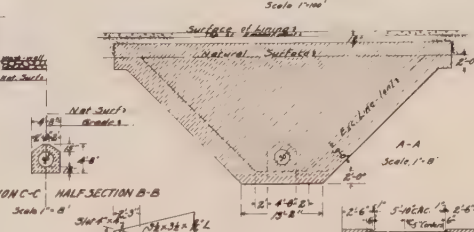
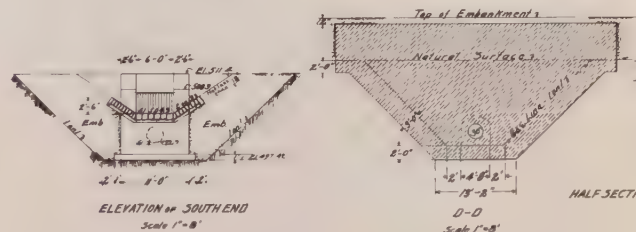
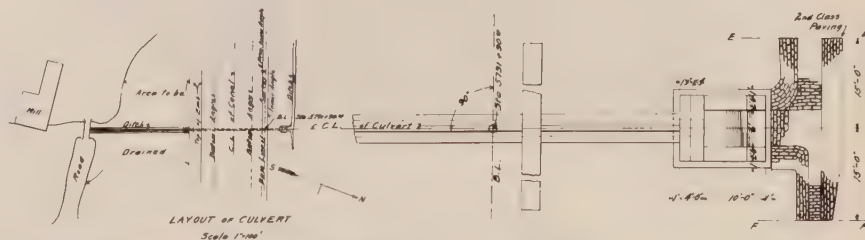
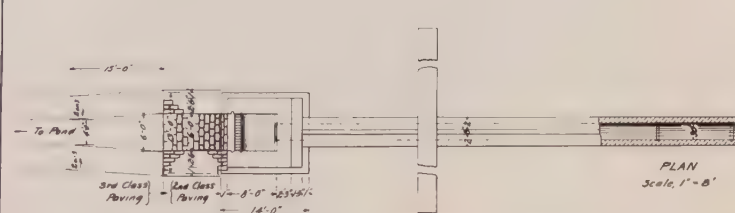
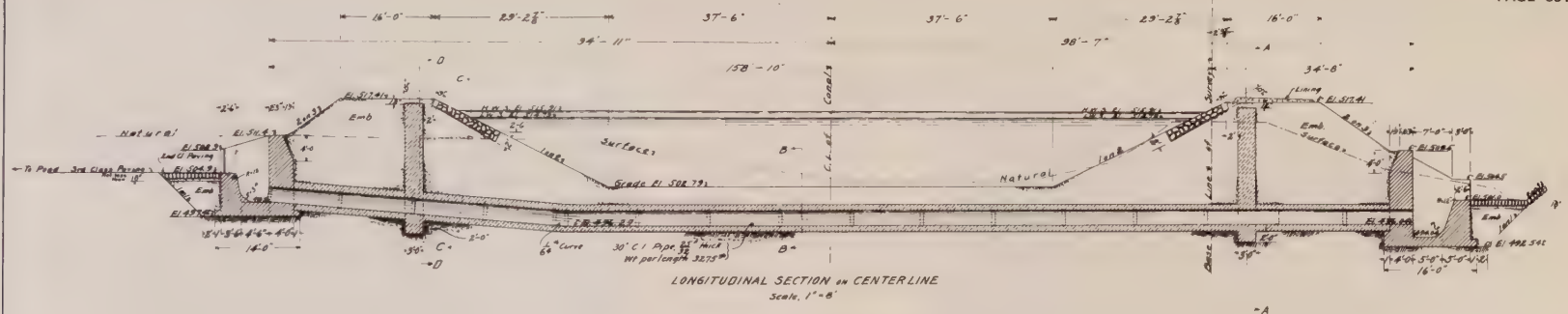


Exit
Headwall and wingwalls were in good condition. There were only a few small cracks

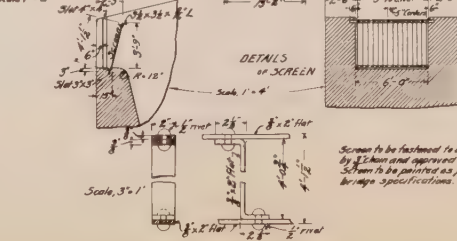
This 30" cast iron pipe carries two steel 6" sewage pipes along the bottom. One joint leaked (steady drip stream) about 20' from manhole entrance. Cast iron pipe was in good condition.



Exit
Looking down into pumped out culvert well.



The elevations of the bottom of the structure shown on this sheet are approximate only, and may be changed by the Engineer in any elevation necessary for a proper foundation. Extra precautions must be taken to insure a proper foundation under headwalls. All portions of the Bad Class have 6" of lining underneath. The Class paving A have 6" of lining. All exposed surfaces of concrete are to be rounded to a radius of 1" except where otherwise shown. Eaves of Bad Class paving to be finished by means of paving stone or about 18" deep. This course to be paved for as Bad Class paving. Ranges of Bad Class paving to be protected by a course of paving or about 18" deep. This course to be paved for as Bad Class paving.

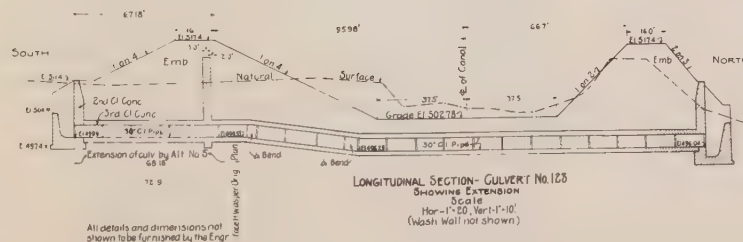
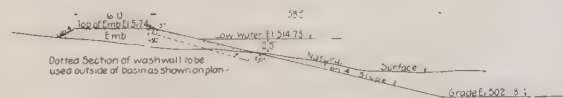
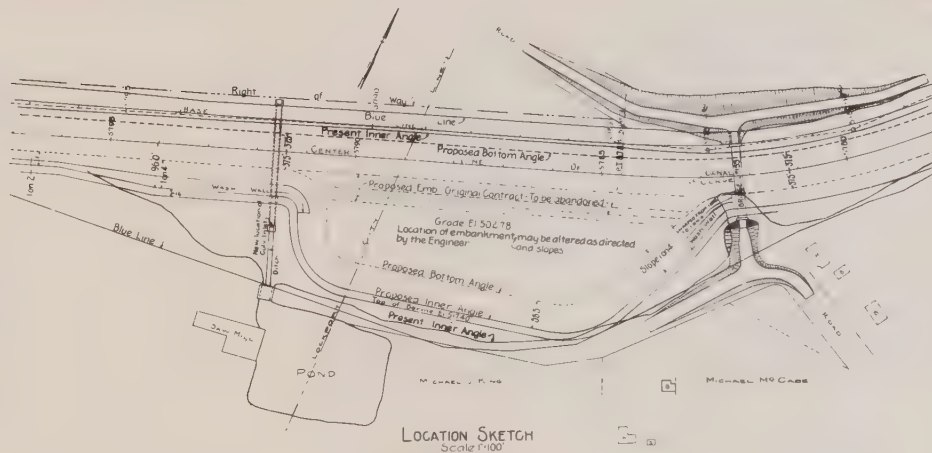


CULVERT NO. 123

SEE CHANGES
PAGE 365**Contract No. 66.**

Erie Canal Section X.

Between Gasport and Lockport
DETAIL PLANS FOR CULVERT.
STA. 5791+90.60NEW CULVERT LOCATION
Scales as indicatedExamined and approved
Special Duty State Engineer
May 9 1905MADE BY J. B. Buehler, June 10
TRACED BY J. B. Buehler, June 10
IN CHECK BY E. B. Manning
AND CHECKED BY J. B. Buehler, June 10



Contract No. 66

ALTERATION NO. 8

Erie Canal Section 10 PLAN OF EXTENSION OF SOUTH END OF CULVERT 123 & LOCATION SKETCH OF TURNING BASIN

Scales as indicated

Examined and approved

James C. Landis 1910
Special Deputy State Engineer.

MADE BY *Stebbins* p. 10.
TRACED BY *Stebbins*
1/11 CHECKED BY *Stebbins*
REV CHECKED BY *Stebbins*

Culvert #124 157' of 2.5' X 2.5' Concrete Box
Not Inspected



Entrance Area

Manhole in sidewalk is not entrance. Entrance manhole is under the lawn next to the edge of canal. Exit manhole is buried under the canal towpath on far side of the canal.



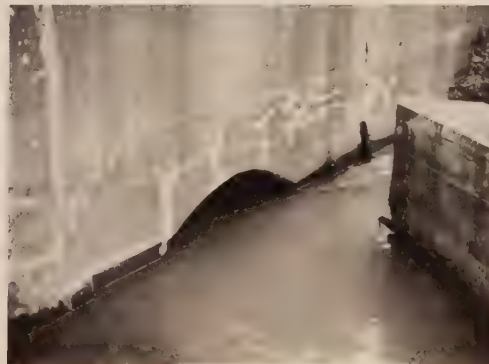
Culvert 125 Exit Area
An old mill once existed here

Culvert #125 (Dive) 118' of 12' Wide by 5'10" High Concrete
Arch and 40' of Stone Block Arch
Not Inspected



Entrance

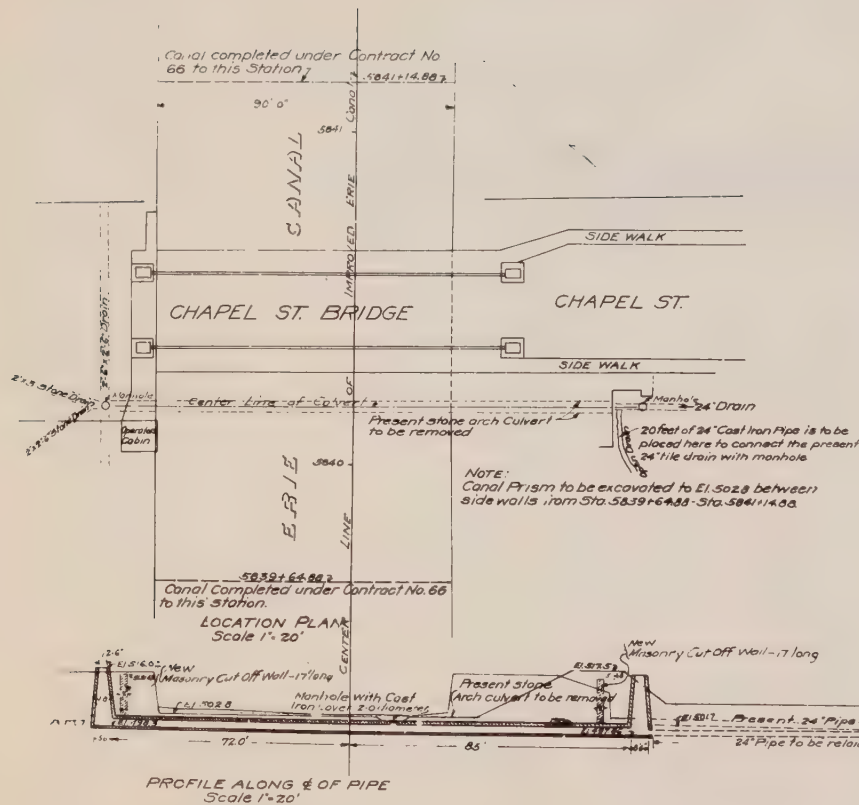
Culvert entrance is under the waterfall. See Lockport Waste Gate and Weir Section for description of problem and pictures.



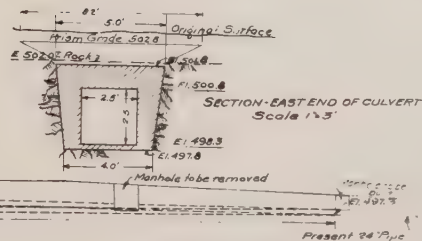
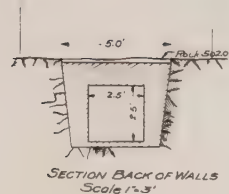
Exit

Headwall in fair to good condition with a few cracks.

Ground Surface Elevation

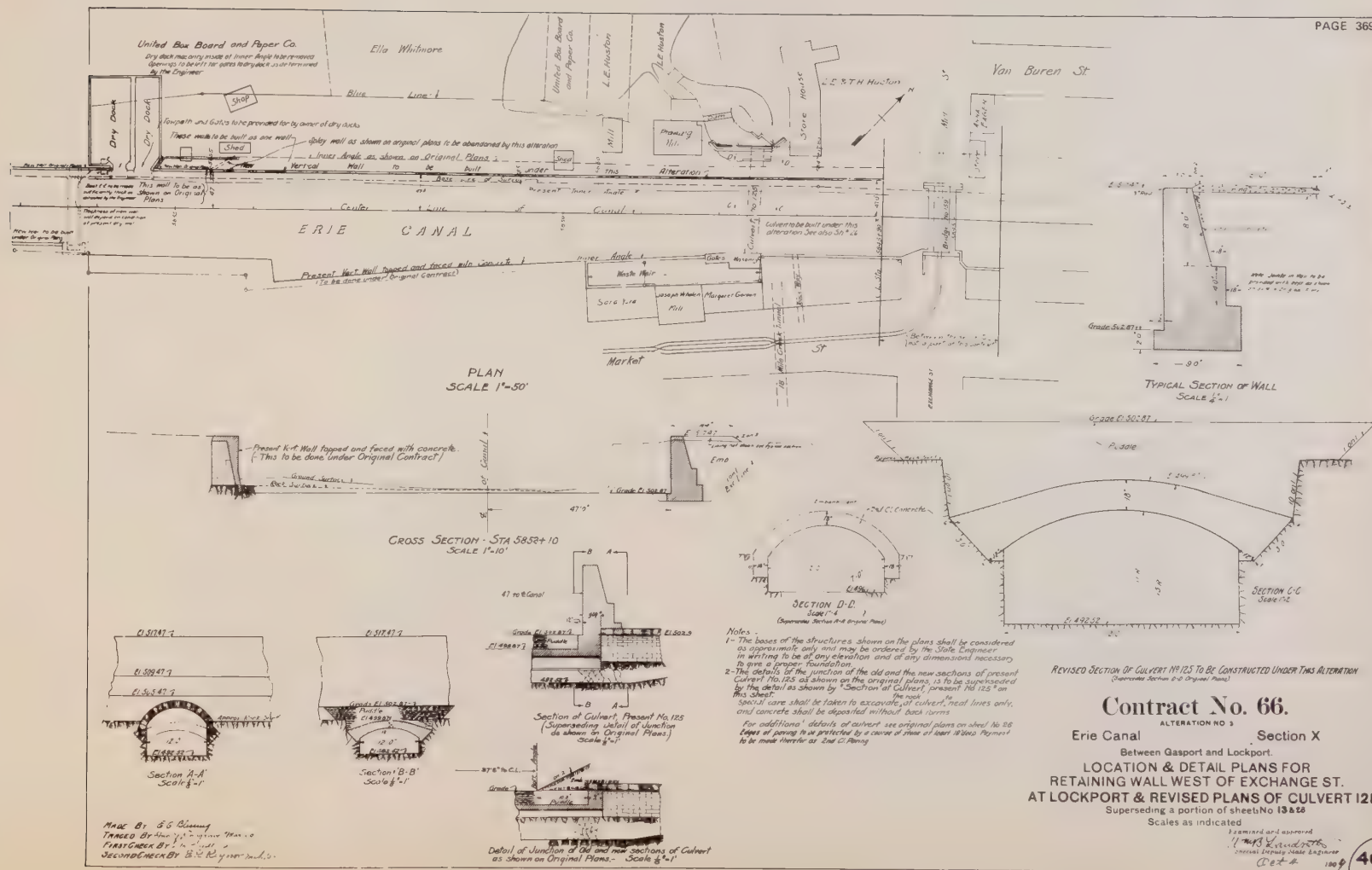


Excavation Lines to be sheeted



SKETCH SHOWING PROPOSED 25'X25' CONCRETE CULVERT UNDER THE ERIE CANAL AT CHAPEL ST. TO REPLACE PRESENT STONE CULVERT.

CULVERT NO. 104
STA. 5840+18



IRONDEQUOIT AND BUSHNELL BASIN TROUGH FLOOR CORES
(See August 1975 Canal Report for Additional Data and Pictures)

On October 29, 1974, a 100 foot long section of the Bushnell Basin Trough floor collapsed into a sewer tunnel being placed under the Barge Canal. During repairs in 1975, the Soil Mechanics Bureau requested that cores be taken down through the floor of the nearby Irondequoit Trough to determine if any voids existed under the trough floor.

Thirty cores were taken along the approximate center line of the trough. The interval between cores on the eastern half of the trough was 100 feet, which was increased to 250 feet for the western half. As the core holes did not show the presence of any voids under the slab, the holes were plugged with concrete.

In 1912, a 500 foot long section of the Irondequoit Trough over Culvert 30 collapsed. Reconstruction of the trough floor in this area (Contract 63-A) resulted in a triple slab floor. Cores 15-20, taken from the reconstructed area, were not progressed deep enough to penetrate the third slab which exists 1.5 feet lower.

Two cores (B.B. 6 and B.B. 7) were taken from the Bushnell Basin Trough floor as part of the investigation to determine required repairs for the Bushnell Basin Trough. Both cores had a 1-2 inch layer of cement grout directly under the top slab. This grout was placed by Canal Maintenance Forces in the middle 1960's.

Core B.B. 34 was obtained from under the I490 Bridge. While driving piles in 1954 to support the I490 Bridge, 1-2 feet of ground settlement or consolidation occurred inside the steel cofferdams next to the east end of the Bushnell Basin Trough. Usually, the ground is forced upward into the confined space of a cofferdam as the piles are driven. Later investigation revealed approximately 6 inches of settlement under nearby areas of the trough floor. Portions of the trough floor under the I490 Bridge were removed, the voids filled, and the floor was replaced. No voids were found under the trough floor area represented by Core B.B. 34.

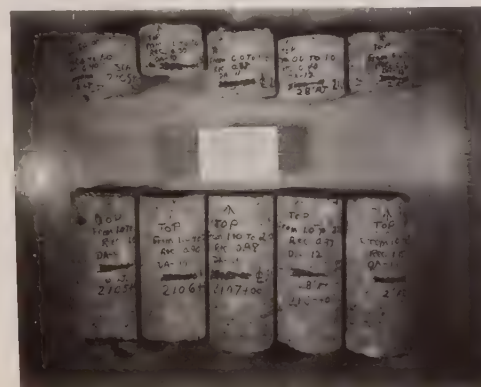
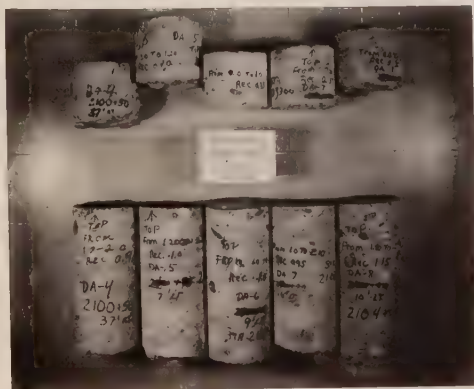
All the cores, except B.B.6, were transmitted to the Materials Bureau for evaluation. The cores and the tar felt waterproofing membrane on top of the bottom slab were all still in good condition.

Conclusion

All cores indicate that the concrete in the trough floors represented by the cores is, generally, in good condition. If the top slab has deteriorated in some small areas it is anticipated that the bottom slab should still be in good condition. However, any existing cracks in the bottom slab would be just about impossible to find.

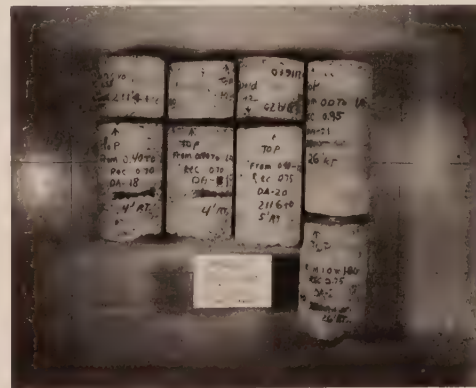
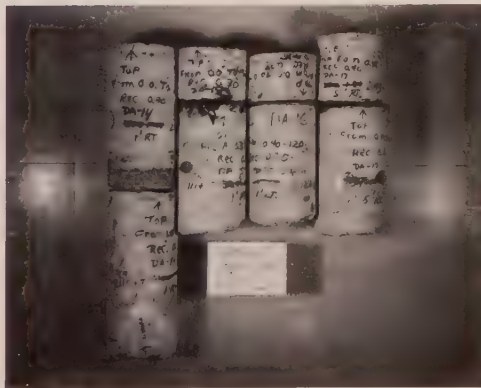
IRONDEQUOIT TROUGH FLOOR CORES

| Core Number | Top Slab Thickness | Sand Cushion Thickness | Bottom Slab Thickness | Depth of Core Hole | Total Concrete Recovered | Comments |
|-------------|--------------------|------------------------|-----------------------|--------------------|--------------------------|--|
| 4 | 5" | 6-1/2" | 11-1/4" | 22-3/4" | 16-1/4" | |
| 5 | 5" | 9-1/2" | 12" | 26-1/2" | 17" | *Rebar 4" from top |
| 6 | 4-1/2" | 7-1/2" | 12-1/4" | 24-1/4" | 16-3/4" | Rebar 6" from top |
| 7 | 4-1/2" | 7-1/2" | 11-1/2" | 23-1/2" | 16" | |
| 8 | 4-1/4" | 9" | 14" | 27-1/4" | 18-1/4" | Rebar 2-1/2" and 13" from top |
| 9 | 4-1/2" | 7-1/2" | 12-3/4" | 24-3/4" | 17" | Rebar 6" from top |
| 10 | 3-1/2" | 9-1/2" | 10-3/4" | 23-3/4" | 14-1/4" | |
| 11 | 4-1/2" | 7-1/2" | 11-3/4" | 23-3/4" | 16-1/4" | 3" deep vertical crack on top of bottom slab |
| 12 | 4-3/4" | 7" | 11-3/4" | 23-1/2" | 16-1/2" | |
| 13 | 4-1/4" | 7-3/4" | 12" | 24" | 16-1/4" | Rebar 1-1/4" and 3" from top |



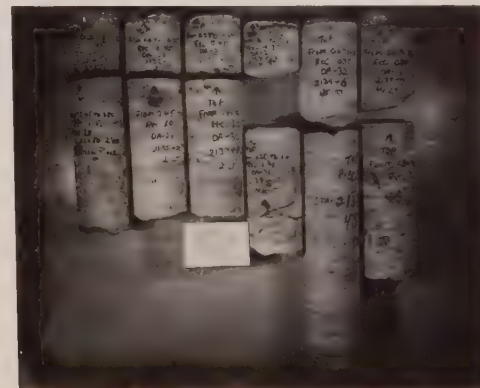
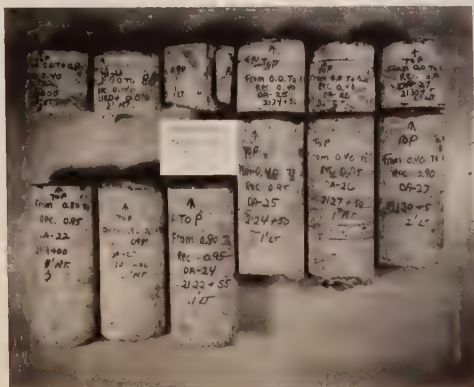
*Rebar = Steel reinforcing bar in bottom slab.

| <u>Core Number</u> | <u>Top Slab Thickness</u> | <u>Sand Cushion Thickness</u> | <u>Bottom Slab Thickness</u> | <u>Depth of Core Hole</u> | <u>Total Concrete Recovered</u> | <u>Comments</u> |
|--------------------|---------------------------|-------------------------------|------------------------------|---------------------------|---------------------------------|--|
| 14 | 10-1/2" | none | 12-1/2" | 23" | 23" | Beginning of 1912 breach repairs |
| 15 | 3-3/4" | none | 9-1/2" | 13" | 13" | Rebar 4-1/8" from top |
| 16 | 3-1/2" | none | 9-1/4" | 12-3/4" | 12-3/4" | |
| 17 | 5" | none | 9-1/2" | 14-1/2" | 14-1/2" | Rebar 5" from top |
| 18 | 4-1/2" | none | 8-3/4" | 13-1/4" | 13-1/4" | Top slab cracked |
| 19 | 4-1/4" | none | 8-1/2" | 12-3/4" | 12-3/4" | Top slab cracked |
| 20 | 4-1/2" | none | 9" | 13-1/2" | 13-1/2" | |
| 21 | 11-1/4" | none | 9" | 20-1/4" | 20-1/4" | Cored through large stone. Possibly end of 1912 breach repairs. |



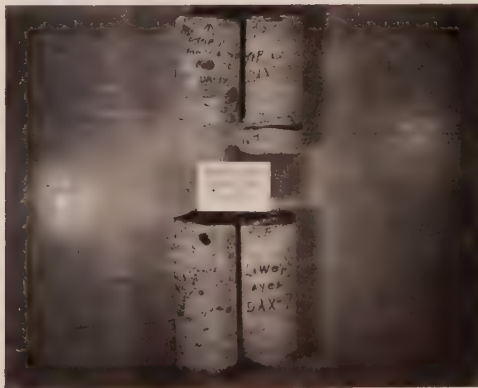
NOTE: A tar-felt waterproof membrane exists on top of all bottom slab concrete.

| Core Number | Top Slab Thickness | Sand Cushion Thickness | Bottom Slab Thickness | Depth of Core Hole | Total Concrete Recovered | Comments |
|-------------|--------------------|------------------------|-----------------------|--------------------|--------------------------|---|
| 22 | 4-1/2" | 5" | 11-3/4" | 21-1/4" | 16-1/4" | |
| 23 | 4-1/2" | 5" | 11-1/4" | 20-3/4" | 15-3/4" | |
| 24 | 4-1/4" | 6" | 11-1/2" | 21-3/4" | 15-3/4" | Cored through joint |
| 25 | 5-1/4" | none | 11-1/2" | 16-3/4" | 16-3/4" | Rebar 2-1/2" and 4" from top |
| 26 | 5" | none | 11-1/2" | 16-1/2" | 16-1/2" | |
| 27 | 5" | none | 10-3/4" | 15-3/4" | 15-3/4" | |
| 28 | 5-1/4" | none | 13-3/4" | 19" | 19" | |
| 29 | 5-1/2" | none | 12-1/4" | 17-3/4" | 17-3/4" | |
| 30 | 5-1/4" | none | 12-1/4" | 17-1/2" | 17-1/2" | |
| 31 | 4-1/4" | 5" | 11-1/4" | 15-1/2" | 15-1/2" | Bottom slab cracked near bottom |
| 32 | 8-3/4" | none | 23" | 31-3/4" | 31-3/4" | Intentional break near bottom. Cored through thrust block at toe of slope. |
| 33 | 7-1/2" | none | 14-1/4" | 21-3/4" | 21-3/4" | Possibly edge of washwall cored. |



BUSHNELL BASIN TROUGH FLOOR CORES

| <u>Core Number</u> | <u>Top Slab Thickness</u> | <u>Sand Cushion Thickness</u> | <u>Bottom Slab Thickness</u> | <u>Depth of Core Hole</u> | <u>Total Concrete Recovered</u> | <u>Comments</u> |
|--------------------|---------------------------|-------------------------------|------------------------------|---------------------------|---------------------------------|----------------------------------|
| 34 | 8-3/4" | 7-3/4" | 13" | 29-1/2" | 21-3/4" | |
| 6 | 10 1/4" + 1 1/4" grout | 6" | 13-1/4" | 30-3/4" | 23-1/2" | Soils data. Core never received. |
| 7 | 9 1/2" + 2" grout | 5" | 12" | 28-1/2" | 21-1/2" | |



CANAL FLOOR LINING
BUSHNELL BASIN (I-490) TO CARTERSVILLE GUARD GATE

The two mile long canal section from the Bushnell Basin Trough at the east end to the Cartersville Guard Gate at the west end is completely lined with concrete. The sides of the canal prism are either vertical walls, as in the Bushnell Basin and Irondequoit Troughs, or concrete slabs placed on the inside slopes.

Construction of the prism floor, however, involved about 5 different configurations at various locations. Since many contract changes were involved during construction, there was confusion as to what was constructed where. Therefore, a station to station prism floor configuration was compiled from the contract plans. Recent cores from the Irondequoit Trough floor showed that one floor area was not as planned. This area was probably constructed prior to an alteration and it was not changed.

CANAL FLOOR LINING

| | |
|---|-----------------------|
| BUSHNELL BASIN TROUGH | Begin Station 2059+05 |
| (Prior to 1974 breach) | End Station 2069+30 |
| | Length 1025 ft. |
| 1913 Plans, Contract 63, Alteration 10, Sheet 159 | |
| 4" Top Slab (10' square sections) | |
| 6" Sand Filling | |
| ½" Tar Felt Waterproofing | |
| 12" Bottom Slab (30' square sections) | |
| (3/8" bars under upper slab joints) | |
| Under Contract M75-2 in 1975, an approximately 240 foot long section near the center of the trough was rebuilt. | |

| | |
|---|-----------------------|
| BUSHNELL BASIN PRISM LINING | Begin Station 2069+30 |
| | End Station 2075+15 |
| | Length 585 ft. |
| 1914 Plans, Contract 63, Alteration 13, Sheet 164 | |
| 12" Slab (8' square sections) | |

| | |
|--|-----------------------|
| BUSHNELL BASIN PRISM LINING | Begin Station 2075+15 |
| (Includes 468' Retaining | End Station 2093+00 |
| Wall, 1911 breach) | Length 1785 ft. |
| 1911 Plans, Contract 63, Alteration 3, Sheet 143 | |
| 4" Top Slab (10' square sections) | |
| 6" Sand Filling | |
| ½" Tar Felt Waterproofing | |
| 12" Bottom Slab (30' square sections) | |
| (3/8" bars under upper slab joints) | |

| | |
|---|-----------------------|
| BUSHNELL BASIN PRISM LINING | Begin Station 2093+00 |
| | End Station 2099+15 |
| | Length 615 ft. |
| 1914 Plans, Contract 63, Alteration 13, Sheet 164 | |
| 12" Slab (8' square sections) | |

CANAL FLOOR LINING

IRONDEQUOIT TROUGH Begin Station 2099+15
 End Station 2110+70
 Length 1155 ft.
 1911 Plans, Contract 63, Alteration 3, Sheet 144
 4" Top Slab (10' square sections)
 6" Sand Filling
 ½" Tar Felt Waterproofing
 12" Bottom Slab (30' square sections)
 (3/8" bars under upper slab joints)

IRONDEQUOIT TROUGH Begin Station 2110+70
 (1912 breach area) End Station 2117+75
 Length 705 ft.
 1915 Plans, Contract 63-A, Sheets 10 & 20
 4" Top Slab (12'x15' sections, south half)
 (12'x12.5' north half)
 ½" Tar Felt Waterproofing
 8" Middle Slab (35'x30'+ sections) (.56 sq. in. bars (#7 bars))
 12"-24" Screened Gravel (tapers from center toward sides)
 12" Bottom Slab (35'x52' sections, south half)
 (35'x43' sections, north half)
 (8' wide x 6" high slabs with
 .56 sq. in. bars over joints)

| | *Specified | Actual |
|--|------------------------|---------|
| IRONDEQUOIT TROUGH | Begin Station 2117+75 | 2117+75 |
| | End Station 2141+00 | 2124+00 |
| | Length 2325 ft. | 625 ft. |
| 1911 Plans, Contract 63, Alteration 3, Sheet 145 & 144 | | |
| 4" Top Slab (10' square sections) | | |
| 6" Sand Filling | | |
| ½" Tar Felt Waterproofing | | |
| 12" Bottom Slab (30' square sections) | | |
| (3/8" bars under upper slab joints) | | |

* Although Alteration #3 (Nov. 1911) plans specified the above trough floor system, concrete cores from the trough floor showed that most of this segment had already been constructed according to Alteration #2 (Sept. 1911) plans. Somewhere between cores taken at Station 2122+55 and 2125+00 is the transition. The assumed transition station is 2124+00.

CANAL FLOOR LINING

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IRONDEQUOIT TROUGH Begin Station 2124+00
 End Station 2137+59
 Length 1359 ft.

1911 Plans, Contract 63, Alteration #2, Sheet 141
 5" Top Slab (10' square sections)
 ½" Tar Felt Waterproofing
 12½" Bottom Slab (30' square sections)
 (3/8" bars under upper slab joints)

IRONDEQUOIT TROUGH Begin Station 2137+59
 End Station 2141+00
 Length 341 ft.

1911 Plans, Contract 63, Alteration #3, Sheet 145
 4" Top Slab (10' square sections)
 6" Sand Filling
 ½" Tar Felt Waterproofing
 12" Bottom Slab (30' square sections)
 (3/8" bars under upper slab joints)

CARTERSVILLE PRISM LINING Begin Station 2141+00
 End Station 2166+69
 Length 2569 ft.
 1915 Plans, Contract 63-A, Sheet 11 (Contract Terminated
 by State)
 12" Slab (30'x30-40' transverse sections)

CARTERSVILLE PRISM LINING Begin Station 2166+69
 End Station 2167+29 Guard Gate
 Length 60 ft.

1918 Plans, Contract 201, Sheet 2
 12" Slab (30'x30-40' transverse sections)
 Grouted stone blocks placed by Contract 63 removed. Other small areas, such as slopes and floor under temporary timber towpath bridge, also paved.

CARTERSVILLE PRISM LINING Begin Station 2167+29
 End Station 2167+45+ Guard Gate
 Sills

Length 16 ft.
 15" Slab, grouted stone blocks placed by contract 63 removed

INTRODUCTION

BARGE CANAL CONSTRUCTION

BUSHNELLS BASIN TO CARTERSVILLE

Early in 1900, the small Towns of Bushnells Basin and Cartersville existed approximately two miles apart on the Erie Canal in the Monroe County Township of Perinton. Over the years, the Town of Bushnells Basin has continued to prosper, but Cartersville ceased to exist soon after completion of the Barge Canal. Today, the only map reference to Cartersville is by the name of the canal guard gate just east of Pittsford, which is still called the Cartersville Guard Gate.

Construction of the Barge Canal between these two places involved one of the most difficult and time-consuming series of projects on the whole 524-mile long Barge Canal System. Numerous problems were encountered which led the engineers to change the original contract construction plans many times.

After the October 1974 collapse of the Bushnell Basin Trough, the Materials Bureau was asked to evaluate the concrete structures on this section of the canal. Early field inspections revealed much unusual construction and this led to a study of the original plans and alterations.

Between 1909 and 1918, a total of four different contracts, plus work by the Superintendent of Public Works, was involved in building this short two-mile section of the Barge Canal. The original contract construction plans and all the many alterations were very confusing as to what was supposed to be constructed, what was actually constructed, and the sequence of construction. After months of research and study, a fairly clear understanding of the whole series of original construction operations in this area has been gained from the following sources:

1. Original contract plans and alterations
2. Report of the Superintendent of Public Works on Canals
3. Report of the State Engineer and Surveyor
4. History of the Barge Canal by Whitford
5. Personal observation
6. Personal interviews
7. Syracuse Canal Museum
8. Rochester Public Library

Therefore, in order to partially explain the events which occurred during the original construction of the Barge Canal and recent repairs, a short history of the Bushnell Basin-Cartersville area has been written. One should also keep in mind that canal traffic and the tow path (many barges were still pulled by horses and mules) had to be maintained between May 15 and November 15

at all times. This created extra hardships on contractors where the Erie and Barge Canals coincided, since much of the work had to be done in winter.

On April 6, 1917, the United States entered World War I and canal construction soon began to fall behind the 1918 opening schedule. Army enlistments resulted in severe labor shortages and war production caused drastic cutbacks in steel and other materials for non-military use. This also led to high inflation and much greater costs to contractors than originally bid. Although the Barge Canal may not have been considered essential to the war effort by everyone, the Erie Canal was transporting materials and food-stuffs destined for overseas. Therefore, completion of the much larger capacity Barge Canal on schedule would provide a tremendous avenue from the industrial midwest to the sea for all types of goods and even small war ships built on the Great Lakes.

Every effort was made to attain this goal. As men and machines temporarily became available from one contract, agreements provided for their immediate transfer to other contracts and back again when necessary to provide maximum use of all resources. Repair of the Irondequoit Trough and lack of steel for railroad structures over the Canal at Rochester both threatened to delay opening of the last segments. Finally, the trough repair was complete, but the structural steel did not arrive. Hasty agreements were made for one railroad

to use the tracks of others already over the canal so that deep rock cuts could be completed.

Early on May 15, 1918, two small ceremonies, witnessed by only a dozen or so people, were held as Mr. Frank Williams, State Engineer, dug a small trench across two dikes on opposite sides of the Genesee River. As machines continued to remove the dikes, water poured into the last two dry canal sections and the Barge Canal was officially opened on schedule. Although another four years passed before all construction was complete, the largest barge capable of passing through the locks could now travel from Albany to Buffalo. Completion of the Barge Canal was soon hailed as one of the greatest engineering feats up to that time.

HISTORY
 BARGE CANAL CONSTRUCTION
BUSHNELL BASIN TO CARTERSVILLE

The Barge Canal was constructed on basically the same alignment in this area as the enlarged Erie Canal. This was accomplished by extending two culverts (#29 and #30) and rebuilding the embankments to permit the Erie to be deepened from 7 feet to 12 feet and widened on the bottom from 56 feet to 75 feet.

The only section of new alignment was west of Irondequoit Creek (Culvert #30) where the Erie Canal swung north about 600 feet to avoid a bend in Irondequoit Creek, and then south in a large "S" curve before joining the existing alignment at the Cartersville Guard Gate. Water surface elevation of the Erie and the new Barge Canal was approximately the same and there were no locks in this area.

Contract 41 Embankment Construction

In 1909, work began under Contract 41 on the construction of earth embankments that would eliminate the "S" curve of the Erie Canal. The east half of the "S" curve was eliminated by constructing a new diversion channel for Irondequoit Creek and building a high embankment in the old stream bed to support the new Barge Canal. This area is presently the west half of the Irondequoit Trough. To drain the low area left between the Erie Canal and the new embankment, a two-foot square concrete box culvert was built. It was placed along the existing side slope of the Erie embankment so that it would not be affected by any settlement in the new embankment. Thus, the culvert was 500 feet long.

Then the Erie crossed the present alignment at the west end of the Trough and swung south about 400 feet. This section of the curve was eliminated by constructing a new embankment on the north side only between the present end of the trough and the Cartersville Guard Gate. The low area between this new embankment and the Erie Canal, then known as the Cartersville Widewaters, was designated as a dumping ground for unsuitable embankment materials. Presently, State Route 96 exists on this filled area.

According to the 1909 State Engineers Report, "The embankments on this contract are made of pure sand, either deposited from dump cars and the material jettied away from the tracks by water-jets, or else pumped to the embankment site by hydraulic dredge."

Contract 63 Canal Widening and Concrete Structures

Between 1910 and 1914, the Barge Canal was constructed between the Wayne-Monroe County Line and Lock 32 under Contract 63. The two high embankment areas at Culverts #29 and #30 were the only ones designed to be lined with concrete. The 40 foot embankment at Bushnell Basin (Culvert #29) was to have a nine inch thick concrete slab lining the canal prism (floor and inside slopes) for 800 feet. At Irondequoit Creek, the canal was designed as a 2860 foot long trough with vertical walls and a waterproofed concrete floor on the 70 foot high embankment over Culvert #30.

About 700 feet east of the proposed trough, a 230 foot long concrete retaining wall was completed in May of 1911 in front of the Rochester Sand Company Pit (presently Russo Sand and Gravel Company). This dock wall facilitated the loading of barges with sand for use along the canal.

The Cartersville Guard Gate at the west end and the Bushnell Basin Guard Gate at the east end replaced nearby existing structures on the Erie designed to stop the flow of water in an emergency.

Due to north embankment erosion about 2000 feet west of Culvert #29, an 1800 foot long section of the inside slope was lined with wood planks (sheathing). This work was completed early in 1911.

At 4:00 P.M. on May 19, 1911, a break occurred at Bushnell Basin in the area of the sheathing which washed out about 100 feet of the north embankment. According to the 1911 Report of the Superintendent of Public Works, "This break was incidentally, if not directly, due to the operations of barge canal contractors." The 468 foot long Bushnell Basin Retaining Wall was immediately built to repair this area and canal traffic resumed on June 11.

Due to this break, embankment slides, and other leaks through the embankment in this vicinity, the need for more positive protective measures for lining the canal prism was emphasized. Alteration #3 (Nov. 1911) called for changing the nine inch thick concrete prism lining over Culvert #29 to a double slab, waterproofed floor with a vertical retaining wall on the north side and

a 12 inch thick slab on the inside south slope. Except for the existing Bushnell Basin Retaining Wall, the canal prism was also lined with a double slab, waterproofed floor and 12 inch thick slab on the inside slopes from the east end of the retaining wall to some 1800 feet westerly by this alteration. The concrete slab on the north inside slope was placed over the wood sheathing.

Then, Alteration #10 (Jan. 1913) changed the 12 inch thick slab on the south inside slope of the Culvert #29 embankment to a vertical retaining wall, thus completing the present Bushnell Basin Trough.

Later, Alteration #13 (Feb. 1914) called for lining the two remaining unlined areas in this vicinity. The 585 foot long prism section between the Bushnell Basin Retaining Wall and the Bushnell Basin Trough, and the 615 foot long prism section between the Irondequoit Trough and the prism lining constructed under Alteration #3, were lined with a 12 inch thick slab on the floor and inside slopes, thus completing the present configuration.

After the 1911 break at Bushnell Basin, the proposed floor of the Irondequoit Trough was changed by Alteration #3 (Nov. 1911) to the same design proposed for the prism floor at the Bushnell Basin Trough and Retaining Wall. Also, this alteration extended the length of the trough 910 feet to the east end of the Rochester Sand Company Pit dock wall. At the west end, the north retaining wall was extended 60 feet, the south wall 120 feet and the prism

was lined with concrete for another 250 feet to where the Erie Canal crossed the new Barge Canal alignment.

In 1911, leaks were discovered in Culvert #30 under the Irondequoit Trough and an extra work order dated March 11, 1912 provided for reinforcing the arch ring of the culvert.

Then, at 8:45 on the morning of September 3, 1912, the nine foot high by 22.5 foot wide stone block arch culvert under the Irondequoit Trough apparently collapsed. This caused the trough to break and approximately 500 feet of embankment was also washed out. By October 15, a temporary trough or flume had been constructed over the breach to maintain canal traffic. The timber flume was 887 feet long, 22 feet wide, 7 feet deep and supported by 25-35 foot long wood piles.

In 1913, the Irondequoit Trough embankment was widened and the 500 foot long, box culvert lengthened by Alteration #11 (Feb. 1913). Thus, the culvert was now over 700 feet long.

In 1913, leaks also developed in Culvert #29 (6 foot wide by 5 foot high stone block arch) at Bushnell's Basin. To maintain navigation, boatloads of clay were deposited on the trough floor to plug the leaks. After a late winter inspection, an extra work order dated April 8, 1914, provided for the placing of a cutoff wall (20 foot long steel sheet piling) at the east end of the Bushnell Basin Trough, removal and replacement of the damaged trough floor over Culvert #29, inserting a 48 inch cast iron pipe inside and strengthening of the old stone arch culvert,

and other work deemed necessary.

After the 1914 navigation season, the floor of the Bushnell Basin Trough over Culvert #29 was strengthened under Alteration #15 (Sept. 1914). A $\frac{1}{2}$ -inch thick tar felt waterproofing membrane, which extended 70 feet on each side of the culvert, was first applied. Then alternate 60 foot long and 30 foot long railroad rails, which weighed 60 pounds per foot, were placed at right angles over the center of the culvert one foot apart on a thin bed of concrete. Reinforcing bars $\frac{3}{8}$ inch in diameter were laid over the rails at right angles and then this was all embedded in a 1.6 foot thick concrete slab.

Meanwhile, in a letter dated May 8, 1914, H. S. Kerbaugh, Inc., contractor on Contract 63, asked the State Engineer that his contract be cancelled for the following main reasons:

1. Their original contract has long since expired (December 31, 1912).
2. Original contract price has increased from \$2 to \$3.4 million.
3. Prism excavation west of Irondequoit Trough cannot be completed as hydraulic dredge will not fit through temporary timber flume.
4. The State is not in a position to have certain items of work done at this time.

On August 4, 1914, the State Engineer submitted a letter to the Canal Board which contained in part the contractor's can-

cellation request, the principle items of work yet to be completed (mainly excavation and concrete prism lining), and reasons for delay of certain work items such as lack of railroad agreements and incomplete plans.

In addition, much more work than that covered by Contract 63 was now necessary and would take two or more years to complete. This additional work consisted of a new culvert, new embankment, new trough and possible new embankment treatment at the Cartersville Widewaters. The State Engineer believed that this could best be accomplished by incorporating the work in two or more new contracts, which should result in lower bid prices, and recommended that Contract 63 be terminated.

On August 25, 1914, the Canal Board agreed with the State Engineer's recommendation and cancelled Contract 63. Finishing up and some additional work continued, however, until December 29, 1914, when the final account was accepted as complete.

In 1914 and 1915, there was a long delay before a final decision was reached on the method of trough reconstruction. Meanwhile, plans for the new culvert and embankment were finalized, and it was important to get this work underway.

Superintendent of Public Works Authorization

By a Canal Board resolution dated October 19, 1915, the Superintendent of Public Works was authorized to perform or cause to be performed, the construction of a new culvert, embankment

repair and of removing and reconstructing the whole or a portion of the timber flume.

However, there was no contract then in progress at or adjacent to the site of this work to which the work might be attached and it was impractical to award a contract for the work due to a lack of time. Therefore, the Superintendent of Public Works negotiated with Myers and McWilliams of Lancaster, Pennsylvania, for performing the work on a basis of cost plus a percentage.

Their plant was near the site of the work and they were able to start operations in November. Work continued through the winter and spring and up to June 16, 1916, when the culvert had been completed, the flume rebuilt and most of the embankment had been replaced. The remaining work was to be done by Contract 63-A which was by then in progress.

The new steel-reinforced, concrete culvert was 508 feet long and consisted of twin 9 foot high by 12 foot wide box culverts supported on wood piles. The remaining section of old Culvert #30, 50 feet east of the new one, was filled with compacted earth and sealed at each end and at three intermediate points by 1.5 foot thick concrete walls.

Some of the earth used in rebuilding the embankment was obtained by excavating the abandoned Erie Canal embankment that formed the east half of the "S" curve. This eliminated the basin between here and the west half of the Irondequoit Trough embank-

ment. Thus, the 700 foot long box culvert, which drained the basin, no longer served any function.

Contract 63-A Irondequoit Trough Repair

In August of 1917, repairs were started on the Irondequoit Trough under Contract 63-A. The replaced section of the Trough has a 6.5 foot high by 3 foot wide and 600 foot long inspection tunnel in both trough walls. The new floor (Alteration #2, July 1917) consisted of a 4 inch top slab, a $\frac{1}{2}$ inch tar felt waterproofing membrane, an 8 inch middle slab, 12-24 inches of gravel and a 12 inch bottom slab. Any water that managed to leak through or around the membrane would travel down through the gravel, along the sloping bottom slab and enter the inspection tunnels where it could be monitored. The joints in the new walls were made watertight by imbedding a strip of sheet lead into each block as it was built.

The width between the vertical walls of the Irondequoit Trough is 96 feet. In the area of the replaced walls with the interior inspection tunnels, the replaced north wall is in line with the previous one, but the replaced south wall is set back an additional eight feet further than the previous one. Thus, there is a 600 foot long section of the trough where the width is 104 feet.

The reason for this additional width was that the temporary timber flume which spanned the breach was built adjacent to the south retaining wall. As originally planned, this flume was to be removed prior to wall reconstruction, but a decision was later made to main-

tain canal traffic during reconstruction. Therefore, it was necessary to move the south wall out eight feet to leave the sidewall supports for the flume in place. The junction walls could not be placed until the timber flume was removed during the Winter of 1917-18.

In early 1918, the progress of Contract 63-A was such as to indicate that the canal would not be ready for traffic on opening day, May 15. After due consideration, the contract was suspended on March 6, 1918, and the work completed under the direction of the Superintendent of Public Works. By using the contractor's equipment and bringing in additional machines, all work essential to navigation was completed in time, but minor work was left to be covered by a future contract.

Contract 63, 63-A and 201 Cartersville

The north embankment, built under Contract 41 between the west end of the Irondequoit Trough and the Cartersville Guard Gate, was strengthened by the addition of three feet of puddle (wet clay and possibly sand, mixed in place to render it watertight) by Contract 63, Alteration #3 (Nov. 1911). Under Alteration #11 (Feb. 1913), clay material was deposited on the bottom of the Cartersville Widewaters to prevent leakage. Then, under Alteration #13 (Feb. 1914), additional soil and clay were added to the Wide-water side of the Erie Canal embankment to prevent seepage into the fields to the south and slides into the Widewaters. Also, clay and other material was added to the floor of the Widewaters.

In 1916, under Contract 63-A, a uniform canal prism was created by constructing a new south embankment which isolated the Cartersville Widewaters. Then the canal prism was lined with a 12 inch concrete slab from the end of the Irondequoit Trough to the Cartersville Guard Gate. However, just as the canal was about filled on the night of May 14, 1917, a 700 and a 300 foot long section of the south embankment slid into the canal and delayed navigation for two days. The slide caused the Cartersville Widewaters to reflow, but the water was retained by the old Erie Canal embankment. Under Alterations #2 (July 1917) and #3 (Feb. 1918), the Cartersville Widewaters was completely filled in with earth and the two south embankment sections rebuilt, but not relined with concrete due to this contract being suspended in March of 1918. Also, a 75 foot long section of the south slope adjacent to the old Cartersville Bridge failed and was also rebuilt with earth.

Then, under Contract 201 in 1919 and 1920, the three south bank sections were relined with 12 inch thick concrete slabs. However, the south bank, between the old Cartersville Bridge and the guard gate (where the Erie rejoined the Barge Canal alignment), was not lined with concrete. Thus, there is a 370 foot long prism section between these points where the south bank is lined with stone. This finally completed the lining of the canal from the east end of the Bushnell Basin Trough (present Interstate Route I-490 Bridge) to the Cartersville Guard Gate with a floor elevation above sea level of 448.4 feet.

In 1954, a leak occurred about 150 feet west (Station 2070) of the west end of the Bushnell Basin Trough. The toe of the north embankment sloughed and about 200 feet of 25 foot long steel sheet piling was driven through the tow path to cut off the leak.

Contracts M57-1 and M58-4 Concrete Repair

Since 1920, there have been only two contracts in the Bushnell Basin - Cartersville area for concrete repair and a few unrecorded isolated repairs by Canal Maintenance Forces. Both of these contracts were for repairs or replacement of the trough walls and concrete prism lining. Contract M57-1 (1957) was for repairs to the north side of the canal between I-490 and the west end of the Irondequoit Trough. Contract M58-4 (1958) was for repairs to the south side of the canal and both sides between the west end of the Irondequoit Trough and the Cartersville Guard Gate.

Of particular interest in Contract M57-1 was repair of the 468 foot long Bushnell Basin Retaining Wall. The eastern 360 feet (includes 47 foot wingwall) of this wall was to be repaired one-two feet deep in many places while the western 160 feet (includes 5 foot wingwall) was to be left alone. However, actual repairs were much more extensive and included one-two foot deep replacement of the whole eastern section and a four-six inch refacing of the western section. This explains why the eastern section of this wall is in very good condition.

In 1975, the exposed canal prism floor between the Bushnell Basin Trough was noted as being covered here and there with small thin patches of sprayed on concrete (shotcrete). Although the whole floor had been covered with shotcrete, practically all of it had been removed by the propeller wash of large boats. This work was also apparently done under Contract M57-1 or M58-4.

Two inch diameter holes through the shotcrete and prism floor indicated that grout (mixture of cement and water) had been pumped under the concrete floor slab. From the east end of the Bushnell Basin Trough to 400 feet west of the Trough, nearly 300 holes on 20 foot centers were drilled through the top slab of the canal floor. Grout was pumped into nearly 200 of the holes to form a 1-2 inch thick layer under the top slab. The 140 foot long, reinforced floor section over Culvert #29 was omitted. This work was done in 1965 by Regional Canal Maintenance Forces.



Concrete Prism Lining
Looking West From West End of Bushnell
Basin Trough



Bushnell Basin Prism Floor
Loose shotcrete with grout hole through
it and the prism floor.

1975 Cartersville Inspection

Under Contract 201 in 1919 and 1920, the contractor was apparently allowed to leave those embankment slabs which slid into the canal in 1917 and other concrete debris on the canal floor. This was interpreted from two notes in the plans. One stated that "Old concrete slabs projecting within prism lines to be removed" and the other that "All points projecting above elevation 449.4 to be leveled." Since the concrete floor was at elevation 448.4, this gave the contractor the option of leaving one foot of material on the canal floor. This additional one foot of debris would not interfere with navigation as the concrete sill under the guard gates was at elevation 449.4.

In late August of 1975, this area between the Cartersville Guard Gate and the Irondequoit Trough was rediscovered and caused some immediate concern. Due to repairs at the Bushnell Basin



Looking West-Cartersville Prism Lining
Note concrete slabs buried in 1-2 feet of
mud and water.

Trough, the water level was now at its lowest level probably since 1919 and a number of concrete slabs were seen just protruding above the water, mud and among the weeds. The slabs were tilted and broken, and the canal bottom looked as if it had buckled and erupted due to extreme forces.

An inspection of this area was made in early September, just prior to the removal of an earth dam that had been placed against the east side of the Cartersville Guard Gate. (Right after the Bushnell Basin Trough collapsed, someone threatened to blow up the Cartersville Guard Gate and release the full head of water on the west side of the gate. The dam was immediately constructed as a precaution.) Broken slabs were found strewn over a 1000 foot long section of the canal floor, but they were only obvious in one short section where they just protruded. The rest were buried in the more than one foot deep mud and water. Since a number of the concrete slabs lining the sides of the canal prism had different construction joint spacing, it was then concluded that the slabs were originally part of the prism lining. How the slabs came to be left on the canal floor was not learned until months later when Contract 201 was closely examined.

Another unusual condition was also noted during this inspection. The concrete canal floor throughout this area was originally constructed at elevation 448.4, but only at the west end of the Irondequoit Trough was the canal floor dry. Between here and the Cartersville Guard Gate sill, the canal floor was



Looking East-West End of Irondequoit Trough
Note how dry floor is compared to 1-2 feet of
mud and water in Cartersville Prism Lining.

covered with a layer of one to two foot deep mud and pooled water. Thus, the floor of the Cartersville prism lining is lower than elevation 448.4, which means that this area must have settled. Undoubtedly, the settlement was due to the placement of unsuitable material and clay under this section of the canal when the Cartersville Widewaters existed. However, no problems are presently associated with this settlement.

Contract M75-2 Bushnell Basin Trough Repair

In the afternoon of October 29, 1974, the concrete floor of the Bushnell Basin Trough collapsed into a five foot diameter sewer tunnel being constructed under the canal by the Greenfield Construction Company for the Irondequoit Bay Pure Waters Authority.



Looking East-Bushnell Basin Trough
Day after floor collapsed.

Although the Bushnell Basin and Cartersville Guard Gates were quickly closed, considerable damage occurred to a number of homes in the immediate downstream area. The break occurred near the center of the trough and left an approximate 90 foot by 100 foot hole in the floor. Amazingly, both concrete retaining walls remained in place, although they had no bottom support for over 120 feet. Due to this dangerous condition, they were soon blasted down with dynamite. Subsequently, seven 30 foot long retaining wall sections were removed from each side of the canal trough to permit repair of a 250 foot long section of the trough and embankment.

Under Contract 63 in 1914, Culvert #29 was reduced in size by the insertion of a 4 foot diameter cast iron pipe inside the old 6 foot wide by 5 foot high stone block arch. Although the area in between was filled with concrete, Culvert #29 did leak slowly at the joints as noted by rust stains and mineral deposits. This culvert was now located adjacent to the break in the trough and most of the reinforced trough floor over it had collapsed into the hole. Since the culvert was undersize, leaked and could be disturbed by reconstruction, the decision was made to replace it with a new 84 inch diameter concrete pipe.

The new Culvert #29 was located approximately 70 feet east of the old one, while the 36 inch diameter concrete encased sewer, whose original construction resulted in the collapse, was located approximately 13 feet east and 6 feet lower than the new culvert. When the new culvert was complete, the old one was completely plugged with concrete.

An open top concrete box, with two 30 inch diameter holes, surrounds the entrance of the new culvert. This is meant to limit the amount of water passing through, except during flood conditions.

Reconstruction of the trough floor and walls was essentially the same design as the original construction, but modern techniques and materials were used. The number of joints in the floor slabs was minimized by using reinforcing steel, synthetic (man-made)

rubber sealers were used in joints and plastic waterstops across joints to make them leakproof, and a synthetic waterproofing membrane was used to prevent the bottom slab from leaking.

While reconstruction progressed, the water table was kept low in the area by using a series of well-points (small pipes with strainers on the ends inserted deep in the ground) to pump out the water. When reconstruction was nearly complete and the well-points had been withdrawn for about two weeks, water was seen leaking through numerous joints into the new 84 inch culvert as the canal was being refilled. However, no one had been in the culvert prior to refilling to note if it leaked then.

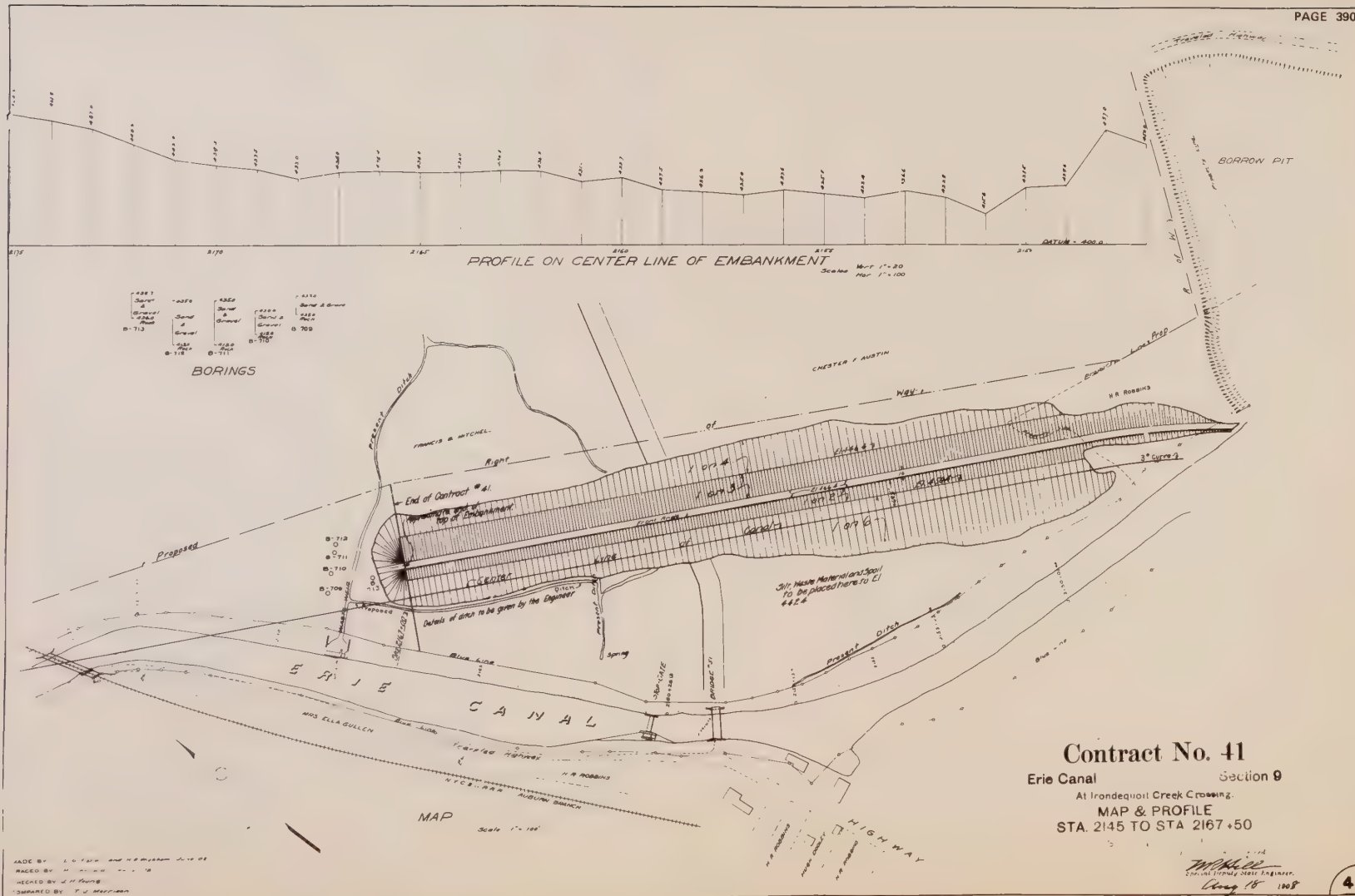
Only the bottom half of the new culvert had been encased in concrete and the joints sealed with a material that had the consistency of thick grease. Therefore, not much water pressure was needed for the water to soon force its way through the joint sealer. This occurred mainly in the lower 1/3 of the culvert toward the middle and lower end. The leaks were easily distinguished by a white residue which coated the joint area. This white residue was also noticed at the downstream end of the culvert where water was coming out from under large rocks.

Samples of all the readily available water sources, including the canal, were tested in the laboratory to try and find the source of the leaks. Since no two matched, it was concluded that the water was from the existing high water table or an underground

spring in this location which moved upward again when the well-points were removed. The leaks had undoubtedly occurred prior to canal refilling, but not noticed until after refilling.

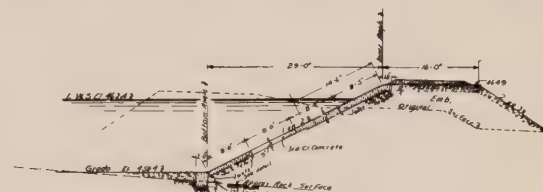
Laboratory tests on the white residue showed this to be a carbonate substance. Since practically the whole breach area had been refilled with a well-graded (very small to large size particles) crushed limestone, which is a carbonate rock, this substance was rock dust being washed out of the embankment. Although limestone is capable of being dissolved by acidic water, the rate at which this will occur at this location was estimated to be extremely slow as the water is basic.

Those joint areas in the culvert which leaked were cleaned out and packed with a fast setting concrete mortar (mixture of sand and cement) to plug the leaks. All reconstruction work for repair of the Bushnell Basin Trough, except for the bottom of the embankment and sewer installation, was done under Contract M75-2 in 1975. The canal was reopened to traffic on September 18, 1975.

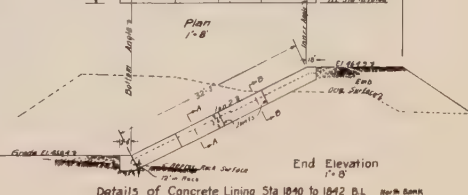
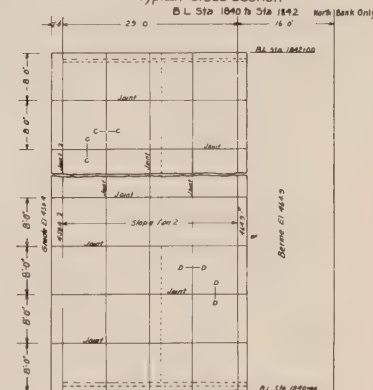
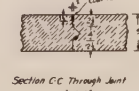
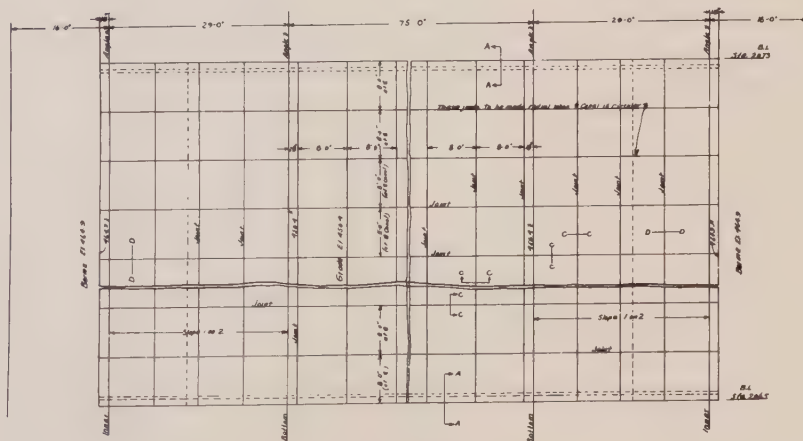




Typical Cross Section
B.L. Sta 2065 to Sta 2073
1'-0'



Typical Cross Section
B.L. Sta 1840 to Sta 1842
North Bank Only
1'-0'



Details of Concrete Lining Sta 1840 to 1842 B.L. North Bank
1'-0'

BUSHNELLS BASIN
Contract No. 63.
Erie Canal Section 9
Between west line of Wayne County and Kings Bend.
**DETAILS OF CONCRETE LINING
OF PRISM**

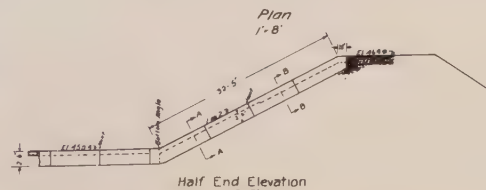
Scale as indicated

SEE CHANGES
PAGE 395, 398

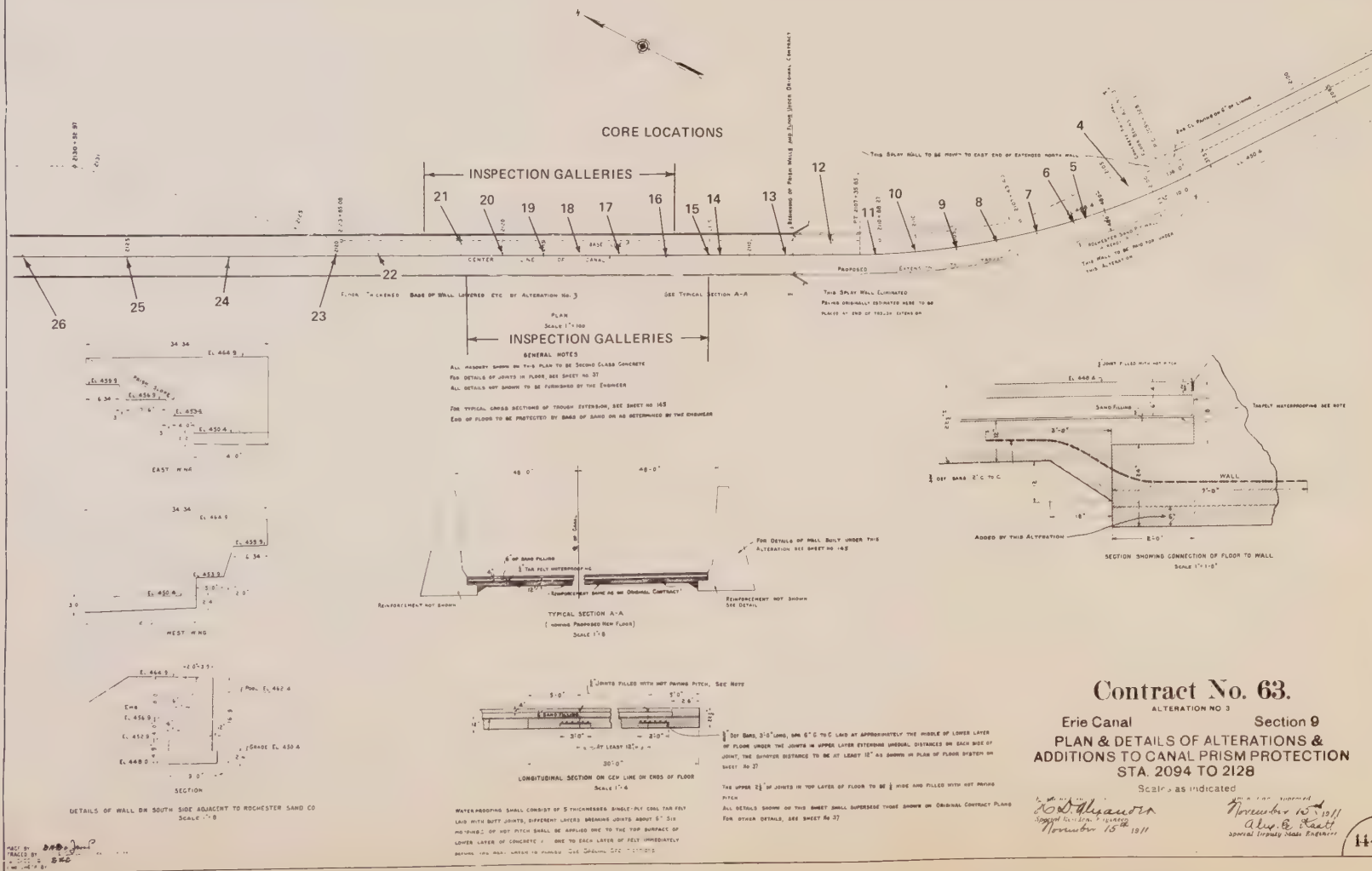
Examined and approved
Wm. B. Smith
Resident District State Engineer
Nov 13 1899

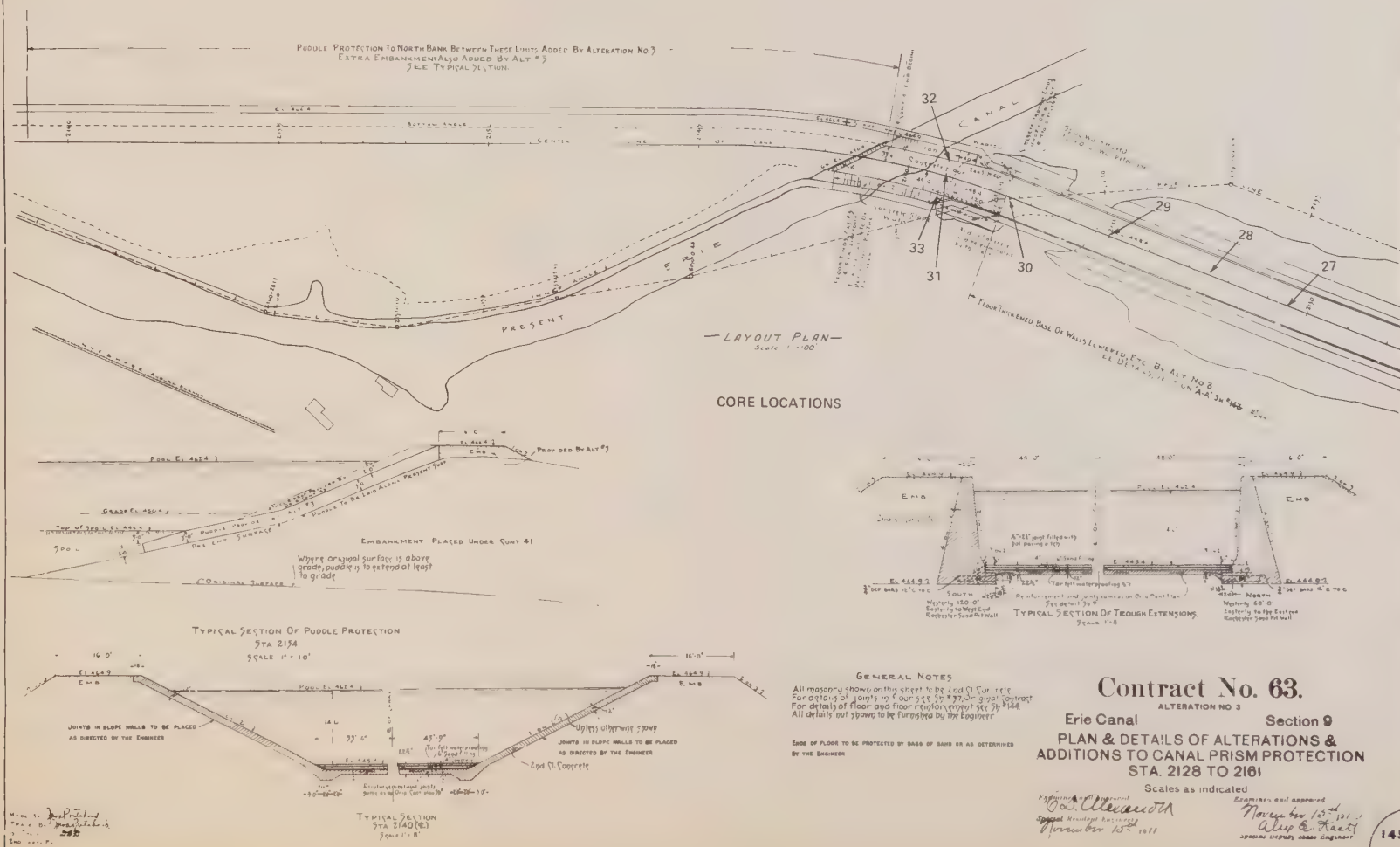
Note:-
All concrete shown on this sheet to be third class.
All unsatisfactory material in the foundation to be removed and replaced by material satisfactory to the Engineer and all material to be thoroughly compacted before concrete is laid. All joints to be provided with keys and made waterproof with coal tar as shown on the plans.
Where the center line of canal is circular the cross joints are to be made radial and 8'-0" c.c. at the center line of the canal.
The exact location and extent of concrete lining shall be ordered by the Engineer in writing.

Details of Concrete Lining Sta 2065 to 2073 B.L.

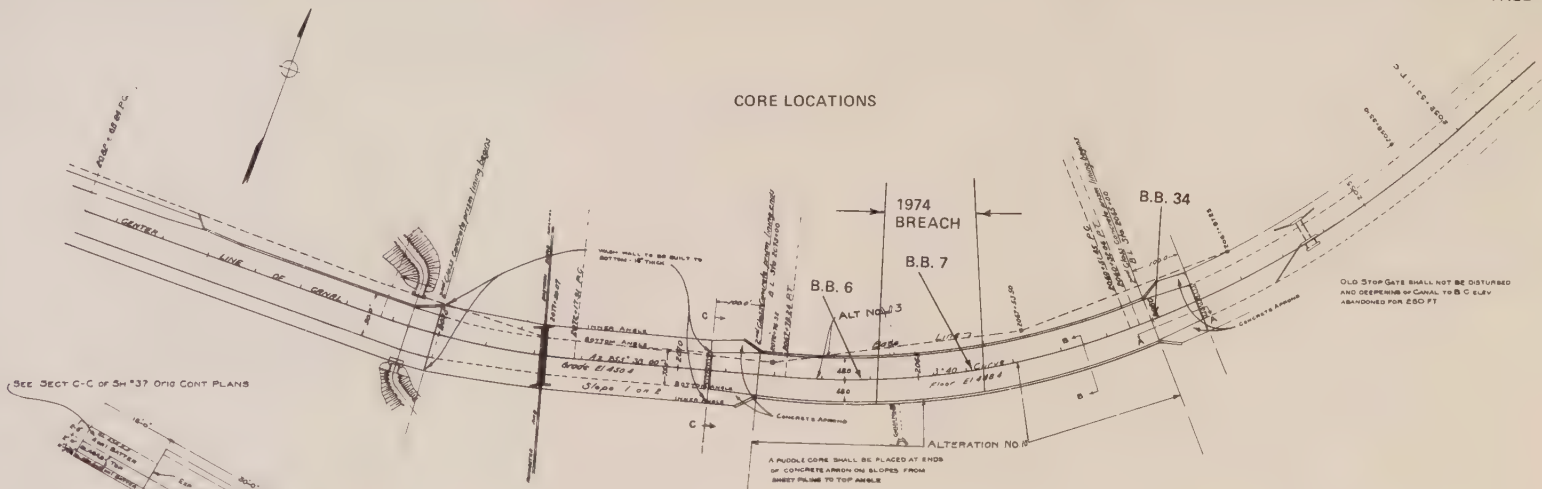


MADE BY *Smith*
TRACED BY *Smith*
CHECK BY *Smith*
Rev. CHECK BY *Smith*, 11-11-99

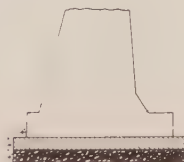




CORE LOCATIONS



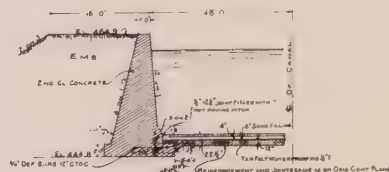
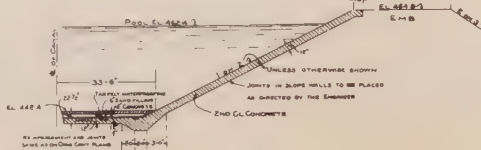
PLAN SHOWING CONNECTION OF SPLAY WITH MAIN WALL



ALTERNATIVE SECT-B-B'

FOOTINGS TO BE SPREAD ON THE BASIS OF 1 FOOT B' IN WHERE CONDITIONS WARRANT
 SAME AND COARSE GRAVEL PLACED AND THOROUGHLY TAMPED TO COMPRESS THE SOIL.

Depth of Underbreaming may be increased if so directed
 the slope of underbreaming to be provided if and as directed
 the necessary to be per 2nd C. Cont. Plan

TYPICAL SECTION B-B' SYMMETRICAL ABOUT C
SCALE 1 IN = 8 FTTYPICAL SECTION C-C' SYMMETRICAL ABOUT C
SCALE 1 IN = 8 FT

C.L. STA. 2059+05 TO 2059+30

Contract No. 63.

ALTERATION NO. 10

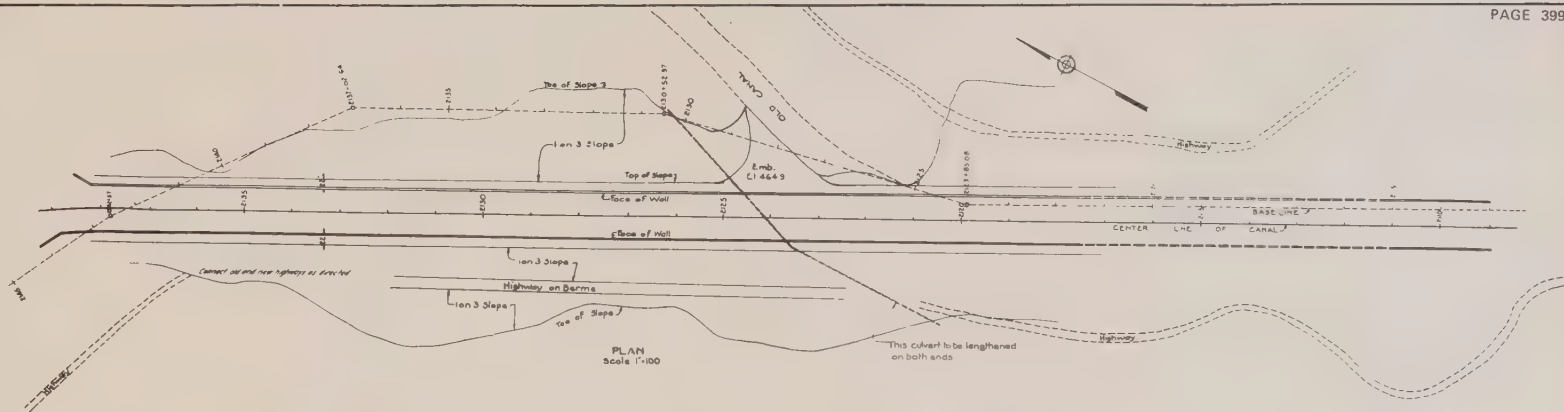
Erie Canal Section 9
 PLAN & DETAILS OF MODIFICATION OF
 & ADDITIONS TO CANAL PRISM
 PROTECTION, STA. 2064 TO STA. 2080

Scale as indicated

Engineered and approved
R. H. Alexander
 Resident Engineer
 January 24, 1978

Designed and approved

Special Deputy State Engineer



GENERAL

NOTES

Bank of canal on north and south sides to be widened to width of 22' with side slopes of 1 on 3 from B.L. Sta. E122.5 to E183.5, as directed by the Engineer except as shown on typical section Sta. 213 where highway on berm along south bank to be covered embankment as directed by the Engineer.

Cuttings 3 of embankments to consist of granular material unless otherwise directed by the Engineer.

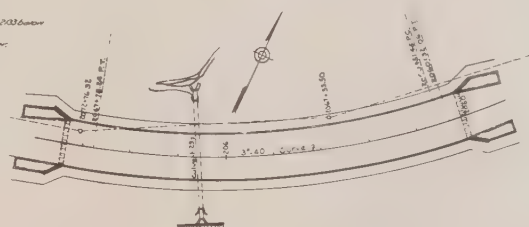
Top of all embankments to be graded to slope away from canal.

Under this additional material of a heavy machine is to be required in Contractor's work under 22.5 Sta. E183.5 to B.L. Sta. E172.5 as directed by the Engineer to prevent leakage.

East of break in through the north and south embankments are to be graded as directed by the Engineer.

All material of through material washed out of line of break to be replaced by gravel and north and south embankments are to be widened as directed by the Engineer.

Final width of additional embankment to be determined by the Engineer.



Note
1. - used on North and South sides of canal from B.L. Sta. 206.5 to B.L. Sta. 207.5 to be graded as directed by the Engineer.
Culvert 29 to be lengthened on North and South ends. Plans to be furnished by the Engineer.

PLAN OF CONCRETE TROUGH AT CULVERT 29

Scale 1"=100

TYPICAL SECTION AT STA. 212.3

Scale 1"=20'

TYPICAL SECTION AT STA. 213

Scale 1"=20'

Contract No. 633.

ALTERATION NO. 11

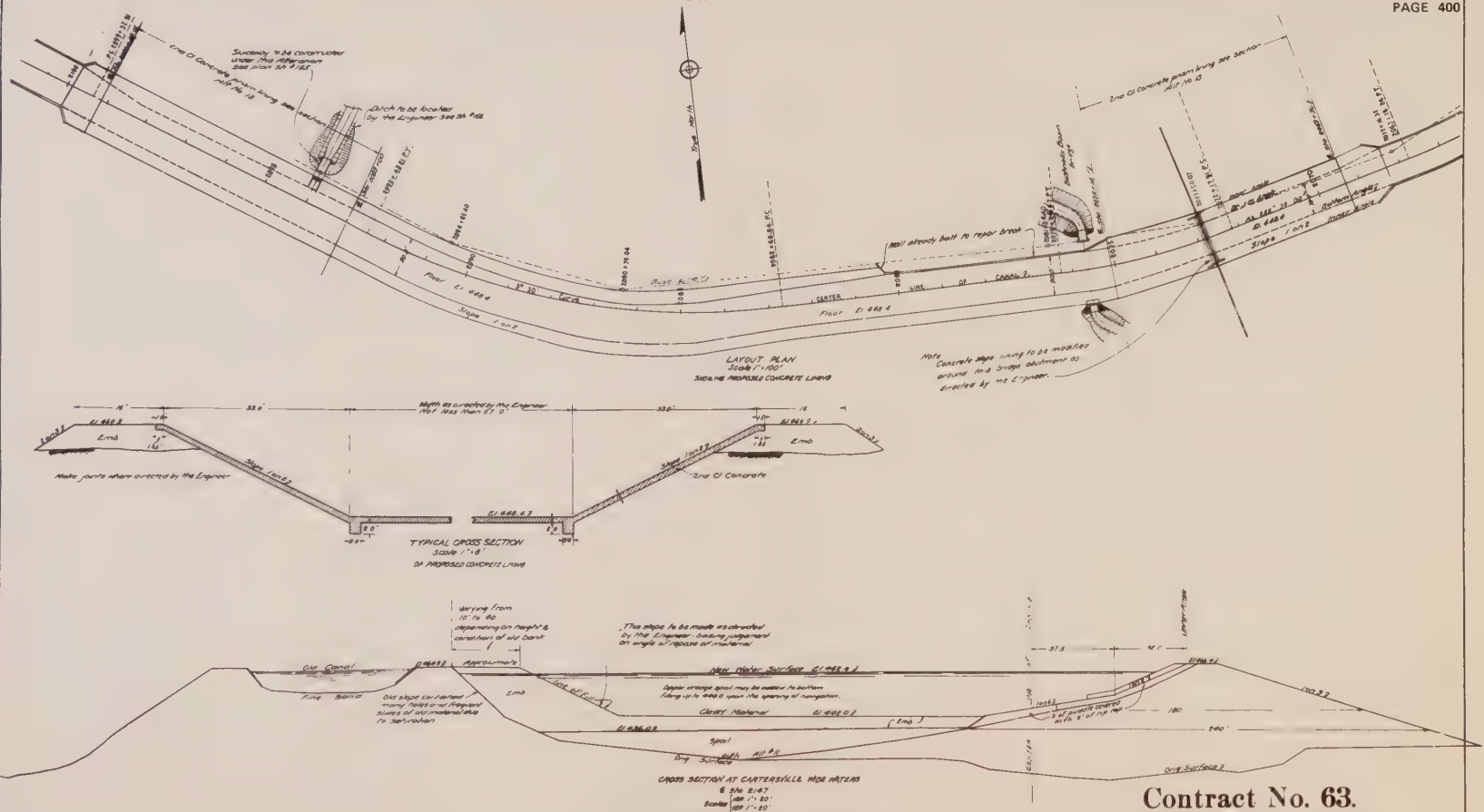
Erie Canal Section 9
PLANS & SECTION FOR REINFORCING
BANKS OF CANAL AT
IRONDEQUIT CREEK

Scales as indicated

Engineer
R. E. Alexander
February 21, 1913

Reviewed and approved
February 21, 1913
W. E. Keast
1st. Locally State Engineer

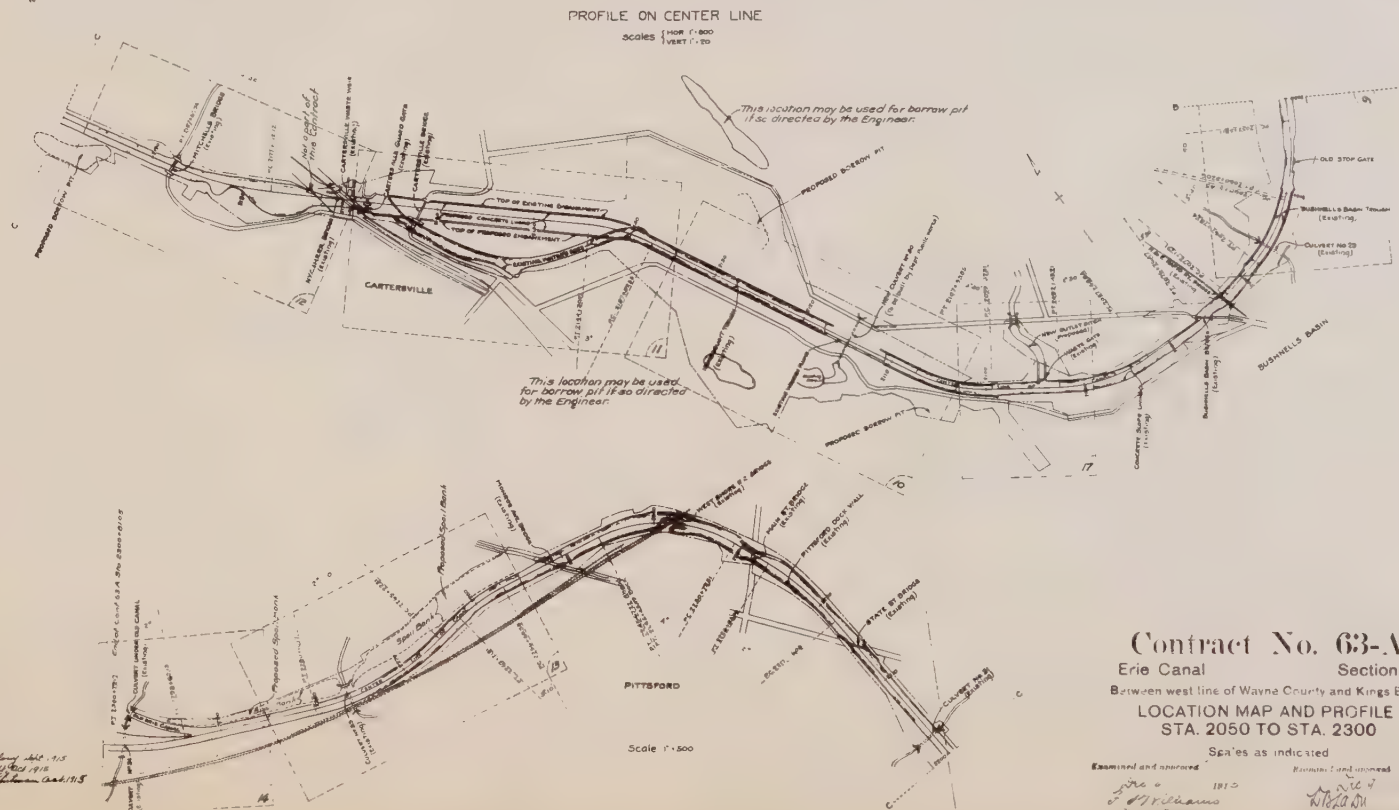
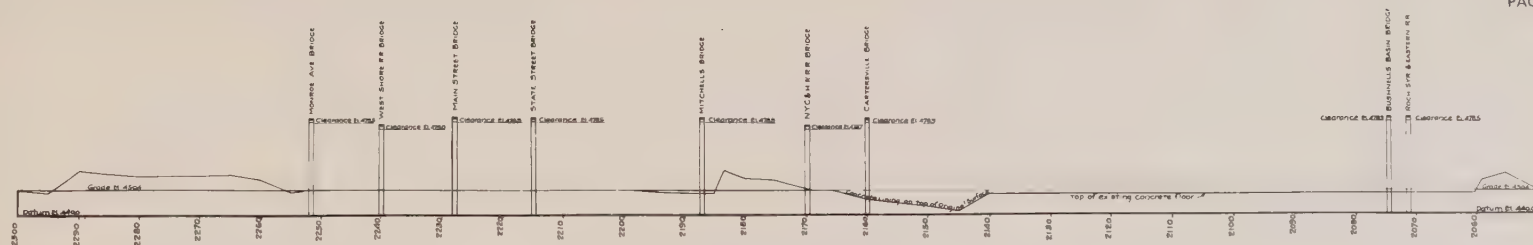
MADE BY 2796
TRACED BY W. E. Keast
CHECKED BY W. E. Keast



Notes By J. A. J. J.
Checked By J. A. J. J.
1st Check By J. A. J. J.
2nd Check By J. A. J. J.

Designed and approved
John Alexander
Superintendent Engineering
February 3, 1914

Examined and approved
Alvin E. Knott
Special Consulting Engineer



MADE BY J. H. Colwell Sept. 1915
 TRACED BY J. H. Colwell Oct. 1915
 CHECKED BY J. H. Colwell Oct. 1915

Contract No. 63-A

Erie Canal Section 9
 Between west line of Wayne County and Kings Bend

LOCATION MAP AND PROFILE
 STA. 2050 TO STA. 2300

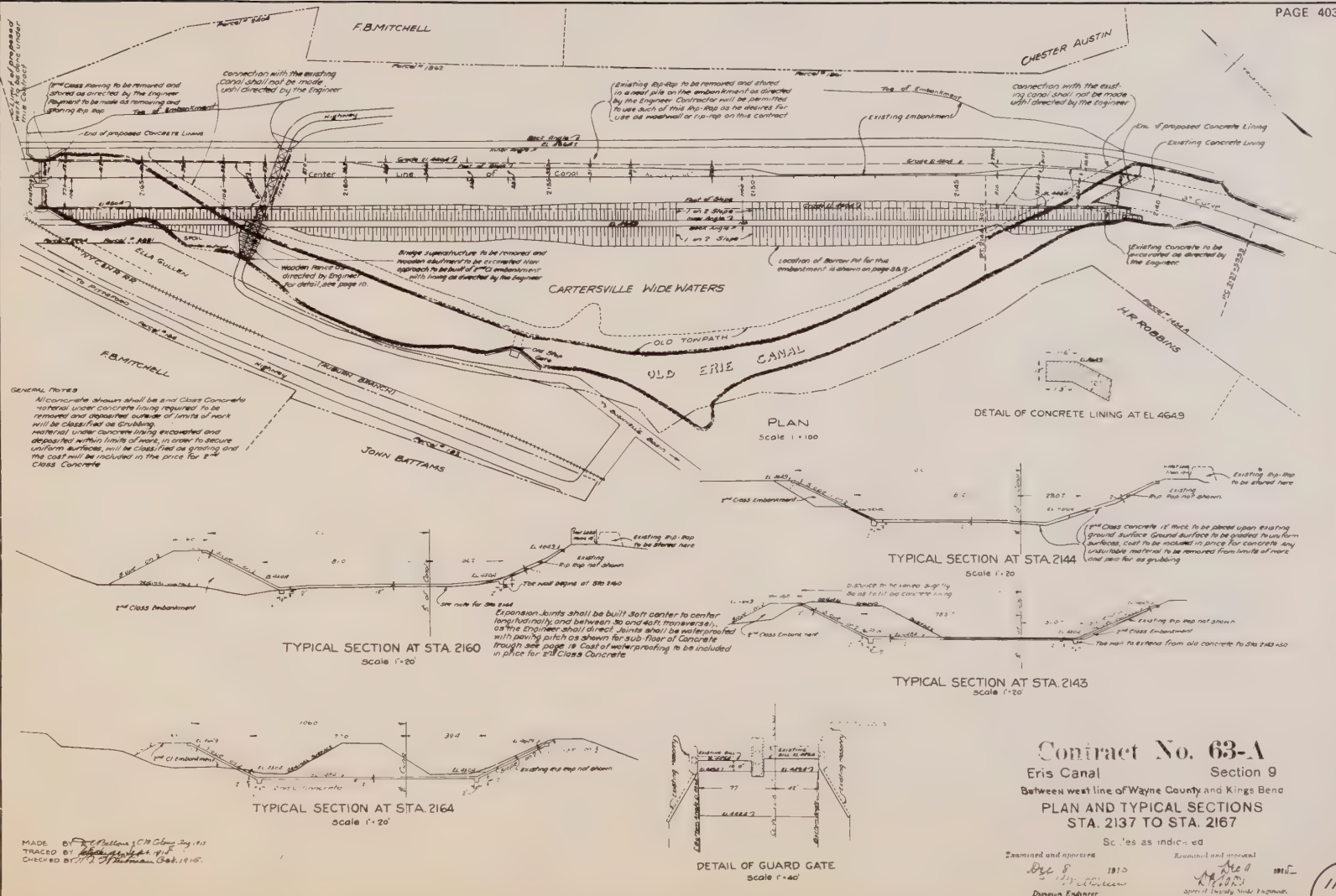
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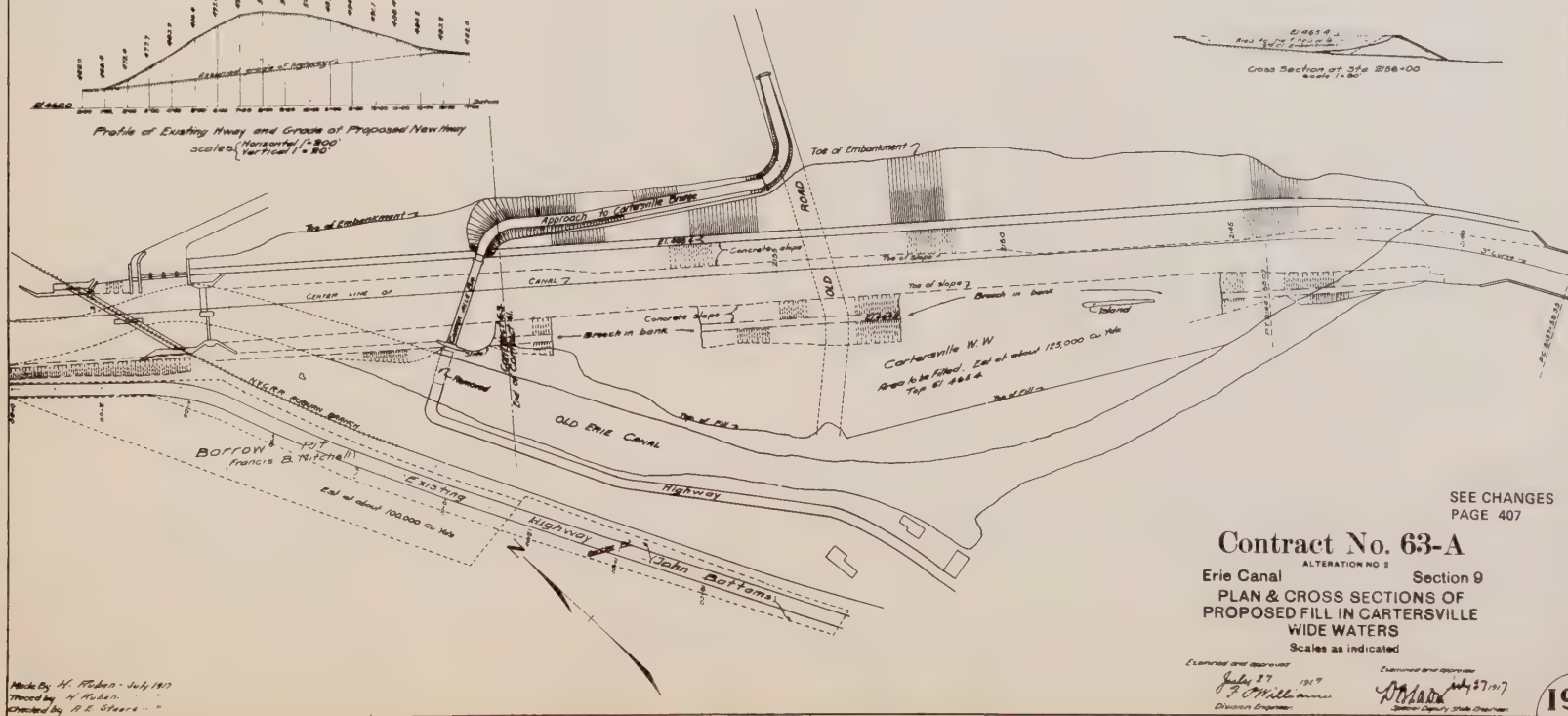
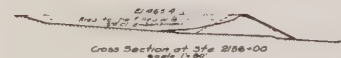
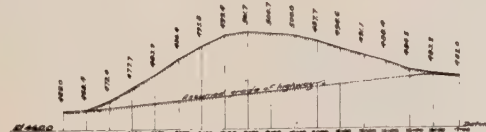
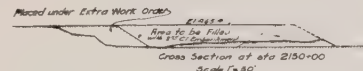
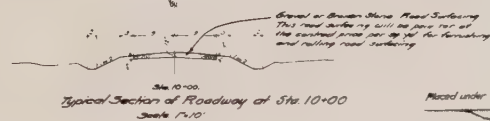
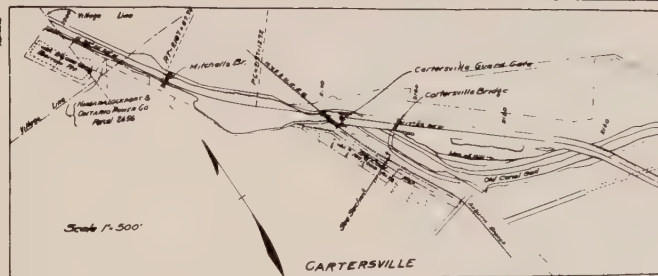
Examined and approved

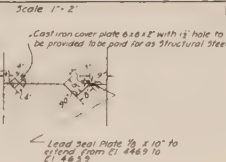
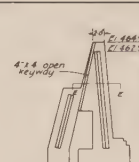
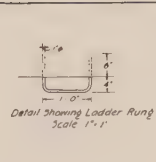
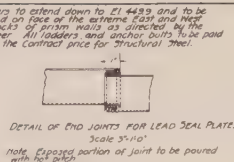
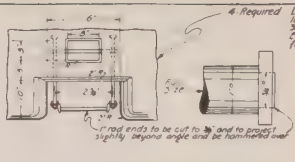
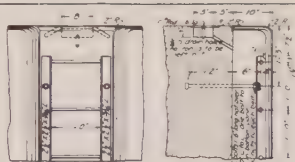
J. H. Colwell
 J. H. Williams
 District Engineer

Revised and approved

J. H. Colwell
 J. H. Williams
 District Engineer







DETAIL OF STANDARD LADDER - Scale 1"=1'

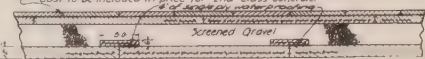
DETAIL OF END JOINTS FOR LEAD SEAL PLATES - Scale 3/4"=1'

DETAIL SHOWING LADDER RUNG - Scale 1"=1'

DETAIL OF KEY WAY AND SEAL PLATE - Scale 3/4"=1'

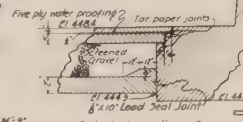
DETAIL OF KEY WAY AND SEAL PLATE - Scale 3/4"=1'

1'-5" joint 4" deep to be filled with hot paving pitch.
Both longitudinal and transverse joints shall be waterproofed in this manner.
Cost to be included in price for 2nd class concrete.



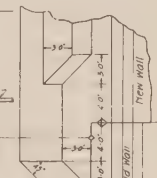
Section A-A

Scale (horizontal) 1"=10, (vertical) 1"=4'

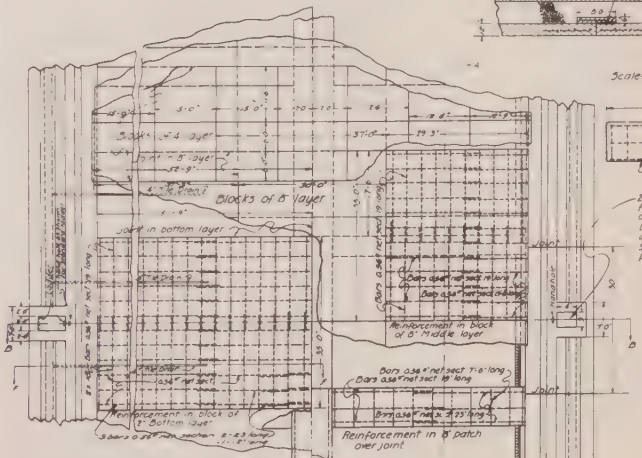


DETAIL OF JUNCTION OF FLOOR AND SIDE WALLS - Scale 1"=3'

PLAN OF SLOPE AT END OF NEW SOUTH WALL - Scale 1"=30'



Section C-C - Scale 1"=5'



PLAN

PLAN SHOWING PATCHES AND REINFORCEMENT OVER JOINTS IN BOTTOM FLOOR - Scale 1"=3'

PLAN SHOWING PATCHES AND REINFORCEMENT OVER JOINTS IN BOTTOM FLOOR - Scale 1"=3'

All masonry abutting on this wall is superior class concrete.

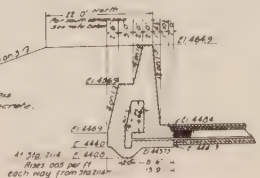
DETAIL OF CONCRETE AROUND 12" CAST IRON PIPE - Section Q-Q - Scale 1"=3'

DETAIL OF CONCRETE AROUND 12" CAST IRON PIPE - Section Q-Q - Scale 1"=3'

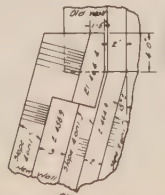


Section B-B - Scale 1"=10'

Section B-B - Scale 1"=10'



Typical Section on F-F North & South walls - Scale 1"=3'



JUNCTION OF OLD AND NEW WALLS - Scale 1"=3'

Waterproofing to consist of 3 thicknesses of single ply coal tar felt laid with butt joints successive layers breaking joints about 6" mappings of hot pitch shall be applied to surface of concrete and to top of each layer of felt immediately before successive layer is placed.

Note: In constructing the 4" inch middle layer a layer of concrete or mortar 1" thick shall be placed upon the screened gravel and allowed to set before placing the remaining 3" of concrete in order to prevent the cement and water from seeping from the concrete into screened gravel. This layer will be paid for as 2nd class concrete.

The top north of embankment covered on the south side shall be not more than 22 feet. If necessary the slope of the embankment above the new roadway shall be increased whenever they come in order. Retain the north of end but in no case shall the slope of the embankment be less than 3:1.

Note: Old 24" G.I. Drain with concrete casing and pedestal to be removed as much as necessary. 12 pipe to be inserted to end of old 24" pipe and the connection completed in place as directed by the Engineer.



To be removed - Scale 1"=5'

(Build form to receive pipe about same after wall is completed and set.)

Contract No. 63-A

ALTERATION NO. 2

Erie Canal Section 9
DETAILS OF MODIFICATION OF CONCRETE TROUGH AT IRONDEQUOIT

Scales as indicated

Examine and approve

July 27 1917

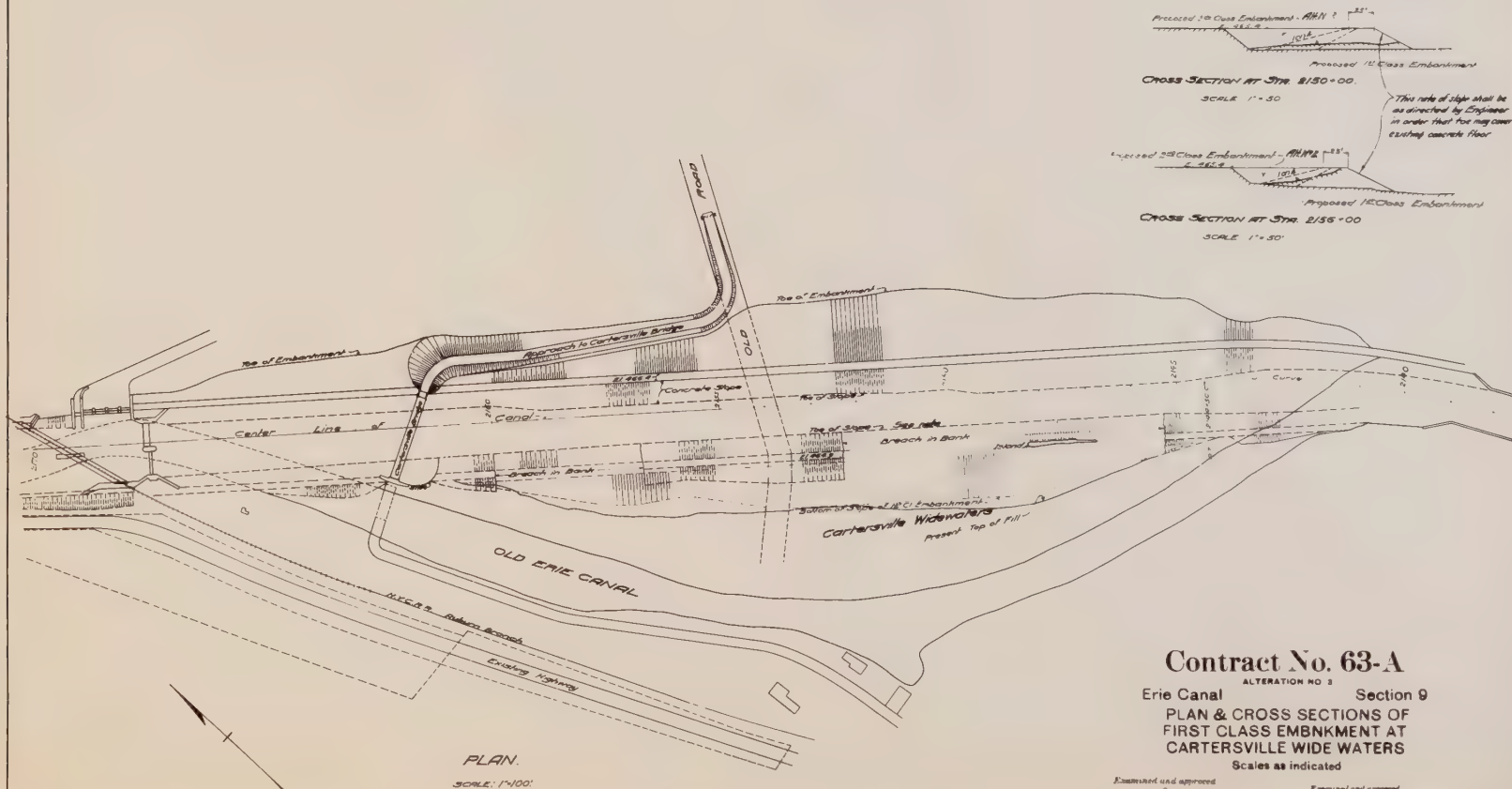
By M. J. McElroy, Engineer

Examine and approve

July 27 1917

By M. J. McElroy, Engineer

Made by B. E. C. Kelly
Traced by B. E. C. Kelly
Checked by B. E. C. Kelly



All historical references to the 1912 collapse of the Irondequoit Trough refer to the cause as the apparent collapse of the culvert (Culvert #30). As a result of the 1974 Bushnell Basin Trough collapse into a sewer tunnel under construction (court litigation still underway) and the existence of troughs at Holley and Eagle Harbor, the reason for the 1912 collapse may have future implications.

The two main reasons given for the 1912 collapse of the 1825 Erie Canal culvert were quicksand under the bottom of the culvert and the great weight of the 71 foot high embankment. (What the courts may have said afterwards has not been investigated.) However, both of these reasons can be easily explained to be of minor consequence. If quicksand did exist at the time of construction, the weight of the embankment would immediately compress the quicksand into a solid foundation. The existing 1825 and 1862 Erie Canal embankment was not raised for the new Barge Canal, but only widened. The north end of Culvert 30 was extended 41.5 feet and an additional 20 feet of fill placed on the north embankment. This increased the weight on the north end of the 1825 and 1862 Erie stone block arch culvert where the break supposedly occurred, but not excessively. A stone block arch is very strong and the foundation had over 50 years to settle.

In order to understand how this collapse most probably occurred, it is necessary to examine the history of the embankment. The Irondequoit Valley in this area contained many areas of quicksand and was considered a dangerous, but the most economical place to cross. About 1000, 20 foot long timber piles were driven into the valley floor to support the large 25 foot wide by 11.75 foot high stone block arch culvert. The culvert floor was constructed of a series of criss-crossed timbers and planks. Local sand and gravel deposits were used to construct the high embankment. To make the canal watertight, the canal prism was first lined with a network of timbers. Then, thick clay was placed over the timbers to seal the prism, but leaks into the culvert probably developed the first time the canal was filled. Over the years, most of the leaks were most likely reduced by relining the canal prism with clay on a yearly basis.

In 1840, enlargement of the Erie Canal began. Probably because of the leaks, plans for a new 30 foot wide by 16.5 foot high new stone block arch were drawn up and approved in 1851. Some time prior to 1856, however, serious leaks and possibly some stone block slippage must have occurred in the culvert. To strengthen this area, another stone block arch was constructed inside the original culvert. This solution must have worked well as the 1851 plans, which would have required removal of the overhead embankment to construct the new culvert, were discarded and new plans drawn up.

New plans dated 1856 showed that 101 feet of the 244.5 foot long culvert had been relined and specified that the remaining 50 feet at the north end and 93.5 feet at the south end also be internally lined with stone blocks. A crescent shaped void with an 8 inch maximum thickness was left between the bottom of the old arch and the top of the new arch. This void was apparently filled with coarse gravel during relining to prevent any stone block movement into this area. Then, the north end of the culvert was to be lengthened 74.5 feet so the embankment could be widened for the enlarged canal. When completed, the culvert was to have a length of 324 feet and a

uniform arch barrel 23 feet wide by 9.5 feet high. This work was probably done in 1857 or soon after.

To achieve the new enlarged Erie Canal 7 foot depth, 3 feet of earth were removed from the bottom of the 4 foot deep canal. Leaks were undoubtedly prevented by constructing a similar type wooden prism and lining the bottom and sides with clay. Between the late 1850's and 1910, a number of additional leaks must have occurred into the culvert. By continually relining the canal prism with clay, the leaks were kept under control.

In June of 1910, construction of the Barge Canal in the vicinity of Culvert #30 began under Contract 63. Due to the number of past culvert leaks and the constant need to reline the prism with clay, the engineers designed a waterproof concrete trough for the high embankment area. First, Culvert #30 was lengthened at the north end with 41.5 feet of concrete arch so the north embankment could be widened again. As this work progressed in 1911, leaks were noticed in the culvert and a few of the stone blocks had slipped down in an area near the north end of the double-lined culvert section. An extra work order dated March 11, 1912, called for this section of the culvert to be internally lined with reinforced concrete. Thus, a 110 foot long area was lined with a 1 foot thick concrete floor and steel reinforced, concrete arch.



Looking East Along North Embankment - New Trough At Right
Note remains of enlarged Erie Canal timber prism lining at lower left.

In 1911, the west half of the Irondequoit Trough was constructed on the new high embankment built under Contract 41 in 1909 and 1910. Between the November 15, 1911, canal closing date and the May 15, 1912, opening date, the east half of the Irondequoit Trough over Culvert #30 was constructed after this section of the embankment had been widened. Approximately 6-7 feet of earth was removed from the bottom of the 7 foot deep enlarged Erie Canal to construct the concrete trough for the new 12 foot deep Barge Canal. After the top of the 1825 sand and gravel embankment had been leveled, the trough walls and floor were constructed.



Looking West Shortly After Break

Between May of 1912 when the trough was filled and through August, it is not known if any problems occurred. At approximately 8:45 on the morning of September 3, the culvert apparently gave way, the trough collapsed and about 500 feet of embankment was washed out.

On September 4, 1912, the Rochester Democrat and Chronicle published a fairly detailed report of the "Canal Break Near Bushnells Basin" in its local news section. (The full report, although it does contain some incorrect information, is included at the end.) The following information was obtained from this report:



Looking East Shortly After Break

"Superintendent Leddy was at the scene of the break at 9 o'clock. He said trouble had been indicated by the canal current some minutes before the break occurred and he had been notified that something was wrong. Patrolman George Schaefer said he went over the section at 8 o'clock and saw no indication of trouble, but a little later he noticed that the current in the canal had been reversed.

A gang of twenty-five men were engaged at the time of the break in putting a jacket of concrete inside the arch. The annihilation of all was averted by the alertness of Michael Sweeney, foreman.

At 8:30 o'clock yesterday morning, Sweeney saw a stream of water pouring out the side of the culvert arch and climbed the embankment, to see what was the trouble. He reached the big conduit in time to warn the men. All immediately reached points of safety, except one laborer who held back until the bank gave way. He was buried in the deluge of sand and water, but he was rescued by his fellows.

After Foreman Sweeney discovered the leak and gave warning to his men, he telephoned to Superintendent Leddy at the weighlock."



Looking East - Embankment Being Prepared for Timber Trough
Note water hose in foreground used to consolidate soil.

Since Sweeney had to climb the embankment to warn the men, it must be assumed that they were not at work in the culvert at the time of the break, but were on the way back to work in the culvert that day to inspect the reinforcing work that had been under construction. When he saw the large leaks, Sweeney ran out to warn the other men who were apparently up on top watching the reversed current in the canal and then telephoned Superintendent Leddy. Therefore, the trough floor failed first.

At this point, it would not have made any difference if the culvert failed or not, as there was no way the embankment could have been saved. With over 60 feet of head, the water could have easily washed out the side of the embankment in the area of the



Looking West - Debris Being Buried in Embankment
Note temporary headwall for culvert exit at lower right.

culvert exit and left the culvert intact. The north end of the culvert did fail, but it is not known when. The failure possibly first occurred in the 50 foot long, stone block arch section that was built according to the 1856 plans. This was the area being internally reinforced at the time of the break. Due to the extremely wide 23 foot width and low 9.5 foot height of this section of the culvert, a large force is needed at the base of the culvert to keep the arch ceiling in place. The failure here could have occurred early from loss of wall support or late when the water removed the surrounding soil. Eventually, about 150 feet of the north culvert end, including the new 41.5 foot long, reinforced concrete arch section, disappeared.



North End of Culvert Has Been Washed Away

Although failure at this time was attributed to quicksand and culvert collapse, the actual reason was due to the indirect result of what is now known as a piping failure. For nearly 90 years, this embankment had been losing soil as leaks washed fine material into the culvert and the stream carried it away unnoticed. By lining the canal with clay, leaks were always plugged at the source, while voids were left below. When the bottom of the canal was excavated for the Barge Canal, all the plugs at the top were removed. Then the concrete trough was placed on an embankment area that undoubtedly had many voids hidden inside. For 4 months, the water filled concrete trough was able to support itself, but the concrete slab floor was slowly cracking and settling. The trough walls would show no sign of sag as they are capable of spanning long distances before collapsing as was shown at the Bushnell Basin Trough in 1974. When finally the slab floor cracked enough to let water through, the water immediately flowed down to the culvert through all the voids. This created more voids which caused the slab to settle quickly.

As the trough floor dropped out and the north side of the embankment washed away, the trough walls remained suspended. By the time, they could no longer support themselves, a large scour hole reaching down to the top of the culvert had probably occurred. When the walls buckled and the huge blocks fell in disarray, one apparently struck the top of the culvert and caused it to collapse. This is the only object heavy enough to have caused a double reinforced 1825 section

of the culvert to fail. Whether this triggered the rest of the north culvert end to fail, or it had failed earlier, is not known. The tremendous force of the water carried a few of these high blocks over 200 feet, but adjacent and downstream property damage was minimal as most of the area was farm land.

Of the four concrete troughs (Bushnell Basin, Irondequoit, Holley and Eagle Harbor) that were constructed on high embankment areas, three have failed. In 1912, the Irondequoit Trough failed indirectly from piping, in 1927 the Eagle Harbor Trough failed probably from settlement and piping, and in 1974 the Bushnell Basin Trough failed as a consequence of sewer tunnel construction.



North End of Culvert After Partial Excavation
Note arch inside of arch and reinforced concrete arch.

As originally designed, the concrete troughs are a good example of sound engineering judgment. The troughs were built as watertight as possible, but small leaks were expected to occur. As long as the leaks were kept under control by the tightness of joints and cracks, no problems would have occurred. Problems did develop, however, because of the failure to recognize that a seemingly insignificant loss of soil by water can eventually lead to loss of foundation support.



Looking East-South Trough Wall was later constructed 8 feet out of alignment to avoid side wall supports for timber flume.

ROCHESTER DEMOCRAT AND CHRONICLE, WEDNESDAY, SEPTEMBER 4, 1912

BIG LOSS BY NINETY-FOOT CANAL BREAK

FIRST ESTIMATE OF DAMAGE PUTS FIGURE AT \$250,000.

25 MEN NEAR DEATH

AT WORK IN CULVERT WHEN LEAK IS DISCOVERED

MAY END SEASON'S TRAFFIC

CULVERT ARCH BREAKS, EMBANKMENT CAVES IN AND CONCRETE AQUEDUCT FALLS, LETTING THOUSANDS OF TONS OF WATER INTO THE VALLEY OF IRONDEQUOIT CREEK - ONE HURT

Concrete walls of an Erie Canal aqueduct confining thousands of tons of water, were undermined and gave way at Bushnell's Basin yesterday morning, precipitating a deluge into Irondequoit Creek. Twenty-five workmen engaged in repairing a culvert below the canal bed had a close call and traffic was tied up, probably for the rest of the season.

The section in which the break occurred has been watched closely since the break at almost identically the same point May 20, 1911, when traffic was delayed to June 30th. The section takes in culvert No. 30, over Irondequoit Creek, about half a mile west of Bushnell's Basin railway station.

The culvert was built in 1840, but has been strengthened several times. A gang of twenty-five men were engaged at the time of the break in putting a jacket of concrete inside the arch. The annihilation of all was averted by the alertness of Michael Sweeney, foreman.

One Caught When Break Comes

At 8:30 o'clock yesterday morning Sweeney saw a stream of water pouring out the side of the culvert arch and climbed the embankment to see what was the trouble. He reached the big conduit in time to warn the men. All immediately reached points of safety, except one laborer who held back until the bank gave way. He was buried in the deluge of sand and water, but he was rescued by his fellows.

At Bushnell's Basin a year ago, barge canal Contractors Myers & McWilliams erected one of the triumphs of canal engineering, an immense concrete aqueduct about half a mile long and ninety feet wide. Under the big conduit was a ninety-foot embankment and at its foot, allowing for the flow of Irondequoit Creek, was old culvert No. 30.

It is believed that quicksand under the culvert allowed the ends of the arch to slip and the keystone to drop from place. With the culvert gone the embankment caved in and for a few seconds the concrete aqueduct was suspended. Then it broke of its own weight and the waters of the canal rushed into Irondequoit Creek, carrying destruction to the farming district within 500 feet of the banks.

Guard Locks Serve Their Purpose

The strict watch kept on this section by Superintendent Leddy resulted in prompt work to avert loss by the inundation of the farming county to the north. After Foreman Sweeney discovered the leak and gave warning to his men, he telephoned to Superintendent Leddy at the weightlock. Orders were given to close the new steel guard lock at Cartersville and the old guard lock at Bushnell's Basin. Action was the matter of a few moments, and damage was confined to land between the guard locks which are about a mile apart.

The break created a sensation along the banks of Irondequoit Creek, but, owing to the small area of land on the bottoms, the loss to farmers was less than might be expected. Prompt work in closing the stop gates reduced losses to a minimum so far as damage to crops is concerned.

Superintendent Leddy was at the scene of the break at 9 o'clock. He said trouble had been indicated by the canal current some minutes before the break occurred and he had been notified that something was wrong. Patrolman George Schaefer said he went over the section at 8 o'clock and saw no indication of trouble, but a little later he noticed that the current in the canal had been reversed.

Quicksand Cause of Trouble

Superintendent Leddy said yesterday afternoon that it was his opinion that the quicksand at the bottom of the culvert was responsible for the breaking of the arch and that its collapse left the aqueduct unsupported.

State Superintendent of Public Works Duncan W. Peck came from Albany yesterday afternoon with William Meggher, State Superintendent of Claims. After making an examination he returned to the Powers Hotel where he will consult with the canal engineers as to the best method of repairing the damage. He gave the opinion that the canal could be repaired by the building of a wooden conduit over Irondequoit Creek, so as to allow traffic late this month. In case it is believed necessary to rebuild the culvert and reconstruct the concrete trough it will take at least six weeks, and probably through traffic will be suspended the rest of the season.

The damage was principally to canal work and is estimated at from \$250,000 to \$500,000. At the first glance, appraisers thought that damage to farm property would be confined to \$10,000, as much of the valley of Irondequoit Creek has been acquired by the State.

Where 25 Were Near Death

When the break of 1911 occurred it was determined to strengthen the culvert by stripping it and placing a foot-thick jacket of concrete, reinforced, over its top. In view of the fact that this would necessitate excavating ninety feet of earth covering the culvert it was determined to place the jacket inside the culvert. This was the work in progress.

Superintendent Peck said he thought it was the most serious break in years. The feed supply for this section has been shut off at Lockport and the level from Lockport to Bushnell's Basin is being maintained.

The break came at a time, when boatmen were about to reap their annual harvest as the crops of wheat, oats, corn and barley are ready for shipment from the grain fields of the West and already big lake fleets are enroute to Buffalo. The canal seasons of the past two years have been unprofitable by delays due to breaks and now comes a big break that practically ties up the canal for the season.

Sub-Contractors Heavy Losers

Leary & Morrison, subcontractors, will be heavy losers. They estimate the damage to their machinery and materials at \$14,000. Immense blocks of concrete, twenty-one feet high and from two to eight feet wide, forming the sides of the big concrete trough, were carried at least 500 feet, some farther.

State Engineer John A. Bensel arrived in Rochester from Albany late last night, accompanied by his secretary, Mr. Neville; I. A. Dwight, engineer of the Eastern Division of the canal with headquarters at Albany; William Kasti, Deputy State Engineer and others. A conference was held at midnight at the Hudson Hotel after which Mr. Bensel said:

"From representations made to me by the engineers, the Superintendent of Public Works, Duncan W. Peck and Engineer E. J. McGovern, I am of the opinion that the break can be repaired in about thirty days. It is possible to build a wooden flume across the gorge which will carry traffic until a more substantial structure can be devised.

I have arranged for a conference of all the canal officials at the Powers Hotel at 8:30 tomorrow morning and at the close of this conference we will go to the scene of the break. After we have thoroughly examined the situation we will determine on a plan to restore the canal service within the shortest possible time."

Mr. Bensel would venture no prediction as to the cause of the break except to indicate his belief that the construction of the barge canal in connection with the operation of the old canal was dangerous at all times.



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